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MILIEU THERAPY IN THE NINETEENTH CENTURY: PATIENT CARE AT THE FRIEND'S ASYLUM, FRANKFORD, PENNSYLVANIA, 1817–1861[1]

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INTRODUCTION

Many of the practices now being introduced in mental hospitals as "milieu therapy" flourished over a century ago in a group of early American and European institutions for the insane. Although numerous general descriptions of the introduction and application of these methods in the United States during the late eighteenth and early nineteenth centuries exist, up to now no detailed investigations of their use in particular asylums have been available. To the authors' knowledge, the following study of patient care at the Friends' Asylum, Frankford, Pennsylvania, from its opening by Quakers in 1817 to the Civil War, is the first of its kind. So far as can be determined, no other similar institution has extant the sort of records preserved at the Friends Hospital, Philadelphia, formerly the Friends' Asylum. Through a series of daily diaries kept by the superintendent and supplemented by annual reports, it is possible to see in detail how psychological medicine—at that time called "moral treatment" or "moral management"—was administered in an early American asylum well-suited to its practice and strongly committed to it in theory.[3] The Friends' Asylum had considerable influence, particularly during its early years, on the development of American psychiatry. As one of the first hospitals in this country designed exclusively for the practice of the new moral treatment it served as a training-ground for several well-known pyschiatrists and attracted the attention of many persons interested in the welfare of the insane.

Compared to other mental hospitals, the Friends' Asylum had certain advantages that made moral treatment easier to apply. It was physically isolated, completely private, and therefore free from outside interference. Since it received no public funds the Asylum was able to choose its patients carefully. It could limit admission to Quakers—as it did until 1834—and did not have to accept the very poor and the criminally insane, the kinds of patients which created serious problems for other hospitals attempting to practice moral treatment.

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[3] This paper is based mainly on the manuscript diaries kept by the various superintendents and on the published annual reports of the Friends' Asylum from 1817 to 1861. The Diary was a daily report until the 1840's when it was kept irregularly, three or four times a week. By the time of the Civil War, the entries had dwindled to one or two weekly. While the superintendents began to report less and less in the Diary about medical and moral treatment in the late 1830's, the annual reports, together with supplementary documents, became more detailed. The Diary and the annual reports together give a fairly good picture of the Asylum's operations from 1817 to 1861. These documents were consulted through the courtesy of Dr. Theodore L. Dehne, Superintendent of the Friends Hospital.

Although this article is documented in detail in its manuscript form, for reasons of space we have here excluded specific bibliographical references, almost all of which are to the Diary and annual reports. Full documentation is available on request.

The Friends' Asylum was established in 1813 by a group of Philadelphia Quakers to provide the most advanced care for the mentally ill of their own faith. The founders considered the best system for curing mental patients to be that introduced by one of the originators of moral treatment, William Tuke, in the Retreat at York, England. According to Tuke, moral management meant kind, individualized care in an asylum where occupational therapy, religious worship, amusements, exercise, and a minimum of restraint and threats were the most effective methods of insuring recovery. He disapproved of most medical therapy; bleeding, blisters, setons, and evacuants appeared to him to be "too inefficacious to deserve the appellation as remedies." A sectarian asylum was considered best because it resulted in a homogeneous group of patients with common religious beliefs. This uniformity guaranteed a wholesome environment during patients' lucid intervals and convalescence.

The Philadelphia Friends sought to implement Tuke's principles. How successful these founders were may be seen from the following description and analysis of the moral and medical means employed at the Friends' Asylum from its opening, during a time of rising optimism about the efficacy of moral treatment, to 1861, when the theory and practice of this method began to be questioned in the United States. In the history of the Friends' Asylum during these years may be distinguished two main periods, which will be treated separately in this paper. The first, from 1817 to about 1834, is a period of sectarianism, attempts to imitate Tuke's system, and some experimentation; the second, from 1835 to 1861, is one of extensive innovation and improvement in moral management and marked changes in medical practices.

1817–1834

THE SETTING

The Friends' Asylum was situated near the town of Frankford, not far from Philadelphia, in a picturesque setting affording a pleasant view for the patients and isolation from curiosity-seekers. In the midst of fifty-two acres of partially-wooded land stood a rectangular four-story building enclosed at the rear by a fence. The inmates slept in private rooms, the men in one wing and the women in the other. The superintendent and his staff occupied the center of the building. Two day-rooms, one for each sex, served as recreation centers in the evenings and during bad weather. On the fourth floor or attic were isolation rooms and dark rooms for disorderly patients.

The small number of inmates before the mid-1830's—from fifteen to thirty during most years—was cared for by the superintendent, his wife, who acted as matron, and two or three attendants caller "caretakers." The superintendents (laymen until 1850 except for a period of nine years) administered all hospital affairs and treatment of patients except the strictly medical aspects, which were the province of a resident physician. The Asylum was governed by a Board of Managers to whom the superintendent was responsible and who visited the Asylum weekly. A "visiting physician" supervised the work of the resident physician and possessed final authority in medical matters.

The Friends hoped, primarily for therapeutic reasons, to create an intimate or, as they called it, "family" atmosphere at the Asylum. Since the superintendent's administrative duties were light and the asylum population small, he, together with his wife, could become well acquainted with each patient. Convalescent patients were accepted into the superintendent's family circle; they ate at his table and spent most of the day in his office.

Upon first entering the Asylum a patient would be kept quiet and relatively isolated for several days in order to become acclimated to his new surroundings. After this period he could participate in the regular routine of the institution. If he was depressed the superintendent might assign him to a room with another patient in an effort to lift his spirits. The superintendent did not deceive the patient about the reasons for his confinement, but assured him that everything possible would be done to make him happy and aid his recovery. He urged him to co-operate in his own interest and warned him that the Asylum had means to enforce its rules.

The Friends wanted to treat their charges as nearly like healthy, rational persons as possible. Contrary to common psychiatric practice of the time, the Asylum staff seldom sought by arguments or discussions to prove the falsity of a patient's delusions; such attempts, of course, proved fruitless. Believing, however, that the mentally ill were capable of more rational activity, logical thought, and normal feelings than was generally realized, the Friends attempted to show respect for patients and to inspire in them a sense of self-esteem.

This attitude is revealed in the Asylum's arrangements for eating, working, religious worship, and recreation. Patients ate with knives and forks which were not chained to the table; the well-behaved and convalescent sat at the superintendent's table. Some inmates worked in open fields without fences or guards, participated in religious worship at the regular Friends' meetings in Frankford, and walked and rode in the woods under a minimum of control. In many cases a patient's promise to behave received the same credence as that of a sane person. The staff was instructed to be not only kind to the patients, but also "active in their employment and amusement."

In addition to the creation of a proper psychological atmosphere supposedly beneficial to all patients, the Asylum gave attention, even in the early years, to the specialized needs of each patient and to the nature of his illness. The depressed patient was cheered and his fears allayed; the volatile patient was humored in an effort to avoid "irritating" him unduly. The superintendent sought to understand each inmate's character and personality so that his particular illness would be more effectively treated. Like most of their colleagues elsewhere, the Asylum physicians recognized that interpersonal relations in the hospital were of importance (especially those between the doctor and patient), but scarcely appreciated the role of family relations in the etiology and cure of mental illness. When they did mention the home and family it was usually to emphasize the need to remove the patient from all former associations because they revived morbid memories.

The superintendent knew that some patients became very attached to particular individuals and that in order to please them they would exercise a greater degree of self-control than usual, or perhaps participate in activities ordinarily repugnant to them. In one such case the superintendent remarked that a previously violent patient was freed from his straps because he did not want the managers, particularly one to whom he had taken a liking, to see him under restraint. In another instance a friend of a patient was asked to remain at the Asylum for a while in order to "excite" the patient to engage in physical labor and thus speed his recovery. That the Friends did not, however, generalize their experience or go deeply into the subject is indicated by the following example: Recognizing the great harm to a patient that her mother's visits produced, the superintendent requested the mother not to see her daughter. He did not, however, conclude that in some way the daughter's relationship with her mother played a role in her illness. The unhappiness produced in the patient by these visits, the superintendent believed, resulted from the bad associations—such as a disappointing love affair—which they revived. Why only the mother revived these unpleasant memories remained an unasked and unanswered question.

CLASSIFICATION OF PATIENTS

The proper grouping of patients according to both their behavior and degree of illnes was considered basic to the practice of moral treatment. When the Asylum was first built, the only classification was by sex, but the necessity for separating the convalescent from other inmates soon became evident. Although it did not contain many dangerously violent patients, the Asylum housed enough boisterous and temporarily violent ones so that the recovery of the less disturbed was hampered. The Asylum's desire to keep the violent and noisy patients away from the quiet and convalescent led to allowing the latter to spend much of their time reading and talking in the superintendent's office. Such a primitive form of separation, however, did not solve the problem of noise at night or of the effect on non-violent and recovering patients of the uproar sometimes made by the more unmanageable inmates confined to their bedrooms or to dark attic rooms during the day.

The history of the early years of the Asylum is in large part one of attempts to improve hospital environment by extending classification. Unfortunately, for many years the Asylum lacked a sufficient number of patients to make such a program practicable. The patient population would have been increased to the desired extent if, when the Asylum's fee was reduced from three to two dollars a week, indigent Friends had also been subsidized. The relatively few poor persons who were helped financially to come to the Asylum by friends and relatives invariably left quickly because of the heavy financial burden of a treatment that took at least an average of twenty-three weeks. They usually went from the Friends' Asylum to either the Philadelphia Alms-house or the Pennsylvania Hospital; if there was no room at these institutions they returned home. To remedy this situation the superintendent suggested in 1821 that the Asylum accept non-Quakers as patients at a rate sufficient to subsidize Quakers unable to pay the fees. Nothing came of this proposal, however, and plans for classification bore little fruit before the late 1820's, when the addition of new lodges slightly separated from the main building made possible more effective isolation of violent and noisy patients. Nevertheless the problem of a sufficient number of inmates for more detailed classification remained until the mid-1830's.

In contrast to many other asylums established in the first half of the nineteenth century, efforts to classify patients in the Friends' Asylum did not serve as a means of separating inmates according to their socio-economic origins. Nor were the kinds of facilities, food, and general treatment determined by the rate paid. With a very few exceptions, all patients fared equally regardless of their payments. The fact that few members of the lower classes and none of the criminally insane were admitted to the Asylum probably reduced whatever pressure may have existed to segregate inmates along socio-economic lines.

MORAL TREATMENT

The Friends believed occupational therapy, especially farming, to be their most important contribution to the practice of moral treatment in America. All patients, regardless of class origins, were urged to spend three or more hours a day in manual labor, the men at farming and gardening and the women at household tasks. Until the late 1830's this work was the main type of active therapy offered at the Asylum, which considered occupational therapy, together with proper patient classification, essential to its system of moral treatment. According to the Friends, labor diverted the mind from morbid thoughts, exercised the body, and helped to restore a proper balance between the physical and nervous systems. It also served to prevent idleness and sloth by inculcating the habits of regularity so much lacking in the insane. Particularly in cases of depression, manual labor was thought to be essential to recovery.

Although the patients' agricultural labor aided the Asylum financially by providing substantial supplies of food for its population, the primary goal of such work was therapeutic. So beneficial did the Friends consider manual labor that in a few cases they employed the cold shower bath to force recalcitrant patients to work; in general, they relied upon techniques of persuasion and reward. Nevertheless, the Asylum failed to attain its goal of employing all able-bodied patients, for many male patients regarded manual labor as degrading, and out of respect for their wishes and those of their families the Asylum staff almost never compelled such patients to work. Since the Friends did not stress mental activity before the late 1830's, the upper-class patient who refused to work remained largely unoccupied. Efforts to find substitutes for farm labor were only partially successful. Gardening had advantages as a replacement for farming because it also diverted the mind and provided exercise in the open air. The seasonal nature of both farming and gardening, however, prevented their serving as year-round occupations, and the problem of winter employment for male inmates remained unsolved during this period.

The Asylum had less difficulty with women inmates, for they usually did not object to work and most of their occupations were not affected by the weather. With little protest they sewed and knitted, shared in the household tasks of the Asylum, and, in season, worked in the garden.

Although the Asylum relied upon manual labor as the main therapeutic tool, it did try to provide various kinds of amusements for the patients in order both to aid their recovery and to keep them occupied. Many of these diversions involved outdoor physical exercise, which was believed to be of special benefit. A favorite with the patients and the pride of the Asylum was a four-hundred-foot circular railroad with a car that two persons could move by foot power. Patients might also play ball and other outdoor games and take walking trips and carriage rides. The less active enjoyed watching the rabbits and other harmless animals kept in the yards. During bad weather the women could do needlework, but the men found little besides checkers and conversation in the day rooms to occupy and amuse them. The Friends did not believe in completely isolating male and female patients from each other (as in some other asylums), and the two sexes would meet at gatherings in the Asylum or at religious assemblies in Frankford. Only rarely did the superintendent permit Friends to come to the Asylum to conduct religious meetings, since he believed that few knew how to preach to the insane. It was the responsibility of the superintendent to determine when the patient was lucid enough to benefit from attending a religious meeting at Frankford. Religious practices at the Asylum were limited to reading from the Bible in the day rooms after supper.

To convalescent patients the Asylum gave great freedom, and on occasion some of them received callers and left the grounds to visit relatives and friends. In general the Asylum discouraged frequent visitors; the superintendent thought that they usually did more harm than good unless the patient was almost well. Although they enjoyed extensive privileges, recuperating patients still had to obey the rules of the institution. Order and regularity, the Friends believed, prepared patients for life outside the Asylum. Because the staff thought that premature discharges often resulted in imperfect cures and subsequent relapses, sometimes as much as three months elapsed between apparent recovery and discharge. Usually, however, relatives removed patients two to three weeks after they learned of their recovery, if not before.

The relative liberty allowed to calm and convalescent patients made escape fairly easy. Some patients managed to climb over the fence surrounding the Asylum yard or simply to walk away during an outing in the woods or fields. During some years as many as twenty inmates ran away. Escapes were most frequent among those working outdoors, for they were given considerable freedom of movement as both an incentive and a reward. The continued emphasis upon such labor despite the frequency of "elopements" shows the importance which the Friends attributed to it as a therapeutic technique. Although almost all of the runaways were returned in a few days and none committed serious injuries to themselves or others, the numerous escapes placed a severe strain upon the Asylum staff. Nevertheless the policy toward runaways was flexible and lenient and reveals much about the Asylum's system of moral treatment. When one such patient was brought back, for example, apparently all the attendants did was to wash her, anoint her bruised feet with oil, and put her to bed. The patient herself observed that she did not deserve such good treatment after having caused so much trouble, and promised not to run away again.

In general escapees might or might not receive punishment, depending upon whether they could understand the significance of their action. A patient so deranged that he did not know right from wrong would not be disciplined but merely placed under surveillance or confinement until the superintendent thought it safe to release him. If he expressed remorse no punishment would follow, but if, in the estimation of the superintendent, he understood that he had done wrong and still remained defiant and unrepentant, he might be confined to a dark room for a few days or weeks and afterwards watched carefully and limited to his movements. A runaway under such discipline could almost always regain his former privileges by promising not to run away again. The superintendents believed that this lenient policy, although it resulted in many repeated escapes, helped eventually to develop the patients' sense of responsibility and self-respect.

Sometimes the escapee wanted to visit relatives and had no intention of remaining away permanently. It was difficult to decide what to do with such a patient, for punishment did not always seem in order. The usual treatment was a reprimand by the superintendent or perhaps a temporary limitation upon the culprit's liberty. An example of the Asylum's flexibility in these matters is the superintendent's response to a patient's sudden insistence, during an afternoon walk, upon going to the city. The superintendent wrote, "I was fearful of urging too strongly his return, lest it would irritate him and concluded it would be best to take him to his father's [in Philadelphia]."

Confinement for long periods to prevent escapes would have meant the virtual abandonment of moral therapy for those concerned. One could never guarantee, moreover, that the most trusted patient would not escape, so that effective security against elopement would involve the surrender of farming as occupational therapy.

Short of giving up their therapeutic methods, the Asylum's staff did attempt to prevent elopements. All patients were locked in their rooms at night, and the superintendent might restrict a patient's freedom or have him closely watched if he indicated an intent to elope. A fence was constructed with bells on it, and bells were also attached to asylum doors. But the basic policy of granting patients a wide range of freedom and the continued stress upon farming limited the success of all security measures. Apart from escapes, no serious mishaps resulted from this liberal policy, in part, probably, because the Asylum had few dangerous patients. What violence occurred usually involved window panes and furniture rather than patients or personnel.

RESTRAINT

That the Friends refused to alter their practices of moral treatment to prevent escapes did not signifiy that they abandoned all but the mildest measures of control. Although they believed kindness to be the most effective means of restoring the insane to mental health, they did acknowledge that sometimes restraint was necessary. Gentle talks with patients, kind attention to their needs, and efforts to convince them that everything done was in their best interests did not make all of them act reasonably. At times even the mildest inmates became noisy, dirty, and intractable. The staff had to find means to quiet the vociferous and calm the violent.

When a patient became unruly the superintendent or the matron first tried to reason with him and appeal to his vanity and sense of courtesy. If cajolery, promises of privileges for good behavior, and appeals to honor and pride were unsuccessful, he might be threatened with various punishments: confinement to bed or a dark room, a straitjacket, various types of hand and foot straps, or the application of a cold shower bath, a favorite and effective form of punishment. If the warnings had no effect, the superintendent would order one or more of these punishments to be employed.

Medical treatment also tended to render patients more obedient. The violent patient would be secluded, bound, bathed, bled, blistered, and cupped repeatedly until he became calm and manageable. The superintendents never used whips or chains, and claimed never to have struck a patient. In most cases the patient's promise to act properly sufficed to deliver him from punishment. The superintendent applied restraint reluctantly to aged inmates and those who seemed unable to control their actions. In these cases the termination of restraint depended only upon the patient's becoming calm; there was no demand that he also express repentance. The superintendent insisted that the staff should not hold patients morally responsible for their actions, and reprimanded a gardener for allowing himself to become involved in a heated argument with a patient.

Restraint did not necessarily mean isolation. In several cases women who destroyed Asylum property were allowed, after two days of confinement to their rooms, to stay in the common day room. Because their violence persisted, however, they had to sit strapped into special chairs that prevented them from doing further damage. These seats, designed by Benjamin Rush and called "tranquilizer chairs," permitted only a minimum of movement. The superintendent believed that they "produced stillness so essential to [the patients'] control and recovery," and accordingly requested more of them as substitutes for the practice of strapping violent patients to their beds. At first some members of Board of Managers, fearing that the chairs might be used excessively, refused to approve the request. Apparently they later relented, for in 1824 the superintendent reported that, with the sanction of the Managers, he no longer employed solitary confinement in small rooms, but instead used "strong chairs." Despite their use of various measures of restraint the Friends prided themselves on their moderation and actually used little restraint in comparison with the neighboring Pennsylvania Hospital, where Benjamin Rush first introduced the principles of moral treatment.

The Friends' Asylum staff did not invariably use restraint upon violent patients, but also experimented with other techniques. In one case the superintendent believed that a patient would soon enter a period of "paroxysm" and suggested that instead of using a straitjacket he would try the effect of liberty under close supervision of which the patient would be kept unaware. This tactic did not work, for a few days later he reported that the patient became so violent that he had to be confined. At times, however, the superintendent did succeed in preventing outbursts and calming violent patients without using force. As time went on a growing majority of patients were considered incurable and therefore were not treated actively; most of them, being quiet, did not require restraint, punishment, or medication.

MEDICAL TREATMENT

The treatment at the Friends' Asylum described so far conformed even in many details to the principles laid down by William Tuke. Unlike the York Retreat, however, the Friends' Asylum did not rely almost exclusively on moral therapy. Along with all other American mental institutions it used medical treatment extensively and considered it an important auxiliary to moral management. To a limited extent the nonmedical staff recognized that medicine had psychotherapeutic value as well. The superintendent remarked in this respect that he gave a patient "bread pills which brought about the required improvement." For the most part, though, medical means were applied for their alleged curative effects on pathological bodily conditions believed either to cause or to result from insanity.

Resident physicians frequently practiced the same kind of medicine in vogue before the introduction of moral management and against which the most famous and influential advocates of psychological medicine, Philippe Pinel and William Tuke, protested. Difficult cases at the Asylum were bled, blistered, and cupped repeatedly, and the physicians often prescribed emetic of tartar, tincture of bark, tincture of digitalis, calomel, and laudanum to cure and subdue patients. Bleeding and low diets were generally confined to violent patients in an effort to quiet them by depletion; as of old the doctors considered the full pulse a sign that both these measures were indicated, although they might prescribe them for almost any case of unusual excitement. Depressed or "lethargic" patients received wine, warm baths, cold showers, blisters, and electric shock to "liven" them up. The effect of electric shock therapy varied; in some cases improvement was temporary, in others patients seemed to benefit for longer periods. Epileptics were treated medically much the same as other patients; the records show that one doctor prescribed anodynes frequently for this illness.

At first, apparently, the relative positions of moral and medical treatment were not clearly defined, for the Asylum records contain conflicting opinions on the subject. The first superintendent, a layman with no previous experience in the care of the insane, expressed satisfaction in 1820 with the resident physician—who was apparently the first to spend much time at his post—but wrote at the same time, "We suppose he is in the practice of administering medicine quite as often as there is occasion and by this means there is not a full experiment made as to the effect of moral treatment." Despite this seemingly clear call for the exclusive use of moral treatment in order to test its effectiveness, the superintendent did not object to all medical means. In fact, the specific practice that he complained of, prescription of a low diet, was just what he himself ordered for a patient a few days later. Another example of his advocacy of methods of depletion was his disagreement with the physician's recommendation of meat and butter for a violent patient. "Strong food may be best for such violent cases of insanity but I very much doubt it," the superintendent wrote. He also favored bleeding, cupping, blistering, and dosing with various drugs which he sometimes administered himself.

It appears, then, that this first superintendent really objected only to the frequency with which the doctor employed medical treatment and to the latter's judgment in specific cases, and had no general disapproval of medical care as an adjunct to moral therapy. The second superintendent, who served from 1823 to 1832, was a physician who gave wholehearted support to the resident physician's use of medicine.

There were many reasons why a physician might take a more favorable view of medical therapy for the insane than a layman. As Luther V. Bell, the superintendent of the McLean Asylum in Massachusetts, noted, a course of treatment that did not employ medicine but which nevertheless resulted in recovery hurt "the pride of medical science." In addition, physicians' desire to help patients induced them to use what-

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ever means were at hand. Medical men also had tradition on their side, for most of the greatest medical authorities of the eighteenth and early nineteenth centuries believed insanity to be fundamentally a somatic disease and emphasized its medical treatment. If, therefore, as Asylum physicians never tired of declaring, insanity was "strictly a morbid state of some of the physical organs, and the deranged manifestation of mind merely the symptoms of that state," then, as they also insisted, medicine was indispensable to its management. This approach did not deny the value of moral treatment, for the disturbances in the brain might "spring from either a moral or physical source," but, as in any other illness, the diseased organs must be treated as well to effect a cure.

An important consideration in physicians' tendencies to view insanity as a physical disease was their belief that such an approach effectively destroyed the supernatural and therefore pessimistic conception of mental illness. Asylum physicians repeatedly emphasized this point. The popular opinion that insanity was "an unintelligible malady of the immaterial existence itself" they thought to be synonymous with the idea that insanity was possible without somatic injury. If mental pathology was purely psychological, they reasoned, then the soul or mind had to be diseased. Since the mind was assumed to be immaterial no human action could effect a cure, and the logical—and to the physicians, unpalatable—conclusion was that insanity was "immedicable, and must be left to the healing virtue of time, and a strait-jacket."

Theoretically the somatic approach could have reduced moral treatment to a minor role at the Asylum. But because its staff and Board of Managers did not fully realize all the implications of somaticism and on the whole moral treatment seemed to be successful and in the spirit of the pervading humanitarianism of the time, the Asylum continued to consider moral therapy as its chief curative technique.

1834–1861

INTRODUCTION

During the years after 1834 there were many changes in the moral and medical treatment practiced at the Asylum, the most striking of which was the general shift in orientation. Before this time the Friends sought to integrate a new system of psychological medicine with traditional medical therapy. Their concern had been not so much with originating new methods of treatment as with implementing those already worked out in detail by William Tuke, and except for their greater use of medical means the Friends followed Tuke's system faithfully. In subsequent years, however, they began to search for improved therapeutic methods, and as a result developed a considerable number of new practices and extended or modified some old ones.

Although never wholly insulated from the work of other mental hospitals, the Friends became considerably more involved in the broader movement of reform during the generation preceding the Civil War. This change is evident in their increasing interest in what non-Quakers said and did concerning mental illness. The number of hospitals for the insane increased to such an extent that the Friends' Asylum eventually had to compete with other institutions for patients, and the work of such reformers as Horace Mann, Samuel Gridley Howe, and Dorothea L. Dix made humanitarian treatment of the insane a popular national concern. In brief, the American Quakers were too small a sect to retain an exclusive lead in the care of the insane, once the rest of the nation became interested in the problem.

CLASSIFICATION OF PATIENTS

After 1834 the Asylum reversed its previous policy and admitted non-Quakers as patients. This step resulted from the Friends' inability to fill the Asylum with self-supporting patients of their own religion or to subsidize a sufficient number of indigent Quakers so that its facilities could be fully utilized and proper classification practiced. By the 1850's the patient population had more than doubled, ranging from fifty to sixty-five, and the ratio of attendants to patients was one to six.

As worked out by 1851, there were four divisions or wards for each sex. The first ward included the quiet, curable, and convalescent; next came the noisy and excited but curable patients; quiet inmates deemed incurable made up the third class; and the fourth ward housed the violent, unmanageable, and hopeless cases. The number of incurable, permanent patients grew steadily; by 1833 their wards were the largest in the Asylum and in 1844 they constituted a "great majority" of inmates. As a rule they received the same general moral therapy as other patients, but were not subject to medical treatment. The Asylum staff looked upon the increase in incurables as unavoidable and as proof of the necessity for early treatment if recovery were to be assured.

Although the new policy of admitting non-Quakers enabled the Asylum to classify patients more adequately, it failed to make possible another long-cherished hope of the superintendents and the Board of Managers: the subsidization of poor Quakers in need of hospital care. Appeals for funds never brought in enough money to enable more than a few such patients to enter the Asylum, even when rates were reduced. As a result, throughout the first forty years of its existence the Friends' Asylum, even more than most other mental hospitals, served patients from the middle and upper classes almost exclusively.

MORAL TREATMENT

After 1834 the Asylum's inmates received increasingly varied and specialized kinds of therapy to suit their individual needs. This change seems to be mainly the result of experience both at the Asylum and at other mental institutions and was a logical extension of the early practice of moral treatment. In 1841 one of the Asylum's attending physicians, Dr. Charles Evans, explained that the nature of insanity made impossible any standard course of treatment, medical or moral. Mental disease, he thought, was not a specific disorder determined by a peculiar and identical series of pathological phenomena, but the effect of a functional disturbance or organic change in the brain arising from various causes and revealed in manifold ways:

> Even in cases where the diseased actions is [sic] the same, the manifestations of insanity are frequently so modified by the temperament, education, and social relations of individuals, as apparently to preclude the possibility of grouping them together in the same class; and demanding that the peculiarities of each be studied, and a judgment come to respecting it, based upon the first development and successive symptoms of the malady.

Manual labor on the farm or in the garden continued to be stressed as "the most effectual of the moral means." But, in an effort to deal with the problem of the male patients who refused to do such work, the Asylum introduced new types of occupations that were, in addition, not affected by the weather. As an alternative to farming or gardening patients might make brooms, weave baskets, and practice carpentry in a specially-equipped room. Although not all of the upper-class patients who resisted farm labor would consent to do woodworking, many of them considered it an acceptable activity. The staff found no danger in trusting patients with tools, so long as those who used them were carefully chosen and under constant surveillance. In 1845 over one-third of the Asylum's male population engaged in some kind of manual labor, a considerable increase over past years. The women continued to work at needlework

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and other domestic duties. The maximum amount of time that patients could perform manual labor with most benefit to themselves was determined to be about three or four hours a day.

Innovations also appeared in the use of recreational and educational therapy. "The more we increase kinds of amusements," wrote the superintendent in 1839, "the more readily are we enabled to meet the peculiarities of every case placed under our care" and thus effect a cure. The staff encouraged social gatherings, and in 1856 a stereoscope was purchased for the amusement of the patients. In 1838 the Asylum sponsored and urged patients to organize a Restorative Society for the purpose of diversifying and increasing their amusements and occupations. Members elected their own officers and, as the Asylum had hoped, acted collectively to improve the spirit of the inmates and influence each other in a positive way. For example, instead of grumbling about their work, they now labored together cheerfully four to six hours daily in the garden or on the farm. Other outdoor activities of the members included fishing, promenading, throwing quoits, playing ball, and flying kites; every Friday evening they held a lecture or debate.

The Asylum discovered that many patients' intellectual capacities and interests were not so greatly deranged by insanity that they could not be stimulated. Dr. Evans believed that in many cases the insane could "appreciate the truths of science," as evidenced by the proficiency some patients attained in subjects like higher mathematics and advanced botany. He and other staff members encouraged mental activity on the part of the patients, and in 1838 the Asylum established a library of books, maps, drawings, and natural history specimens. These collections were quite popular with the patients who had free access to them daily. In 1841 approximately half of all the inmates attended a series of chemistry lectures and three years later a class dealing with unspecified subject matter was founded for inactive demented women. The resident physician reported that this class, in addition to engendering liveliness, greater neatness, and a more cheerful attitude in the women, indirectly provided much-needed discipline. Intellectual activity, he believed, exercised the faculty of attention and consequently in time strengthened and restored it. Experience with educational programs indicated to the staff that mental occupation as well as manual labor was important to the recovery of the curable and to the comfort and well-being of the incurable.

RESTRAINT

As in the previous years, the Asylum was plagued with escapes and attempted escapes, despite new efforts at prevention. In 1845 the superintendent requested a dumbwaiter for serving meals so that the attendants could be with the patients at all times. One man who escaped four or five times had iron bars placed on his room window, and in other cases personal restraint helped to keep patients from running off. Nevertheless, the continuing emphasis on farming and gardening, plus more liberal policies regarding control of patients, kept the escape rate high. The administration admitted that the "improved system of management [where patients were] subjected to much less restraint than was formerly deemed necessary" facilitated flight, but thought that the "advantages of the present mode of treatments" warranted the risks involved.

According to the attending physician's report in 1839, the Asylum applied personal restraint mainly to violent patients and seldom at any other time. In 1855 the superintendent-physician, Dr. J. H. Worthington, who had studied the British system of non-restraint, asserted that a well-ordered and well-classified asylum needed to use very little restraint. Although practicing non-restraint, Worthington rejected it in theory because, like so many other American superintendents, he would not surrender the abstract right to use it when necessary. He relied mainly upon "sleeves" made of soft material to control violent patients, and claimed not to have used even these in the preceding six months. In 1857 he reported that destructive patients who tore clothes or broke glass were no longer placed under restraint. Bed straps would be used only in cases where there was great danger that patients would collapse from exhaustion if their movements were not controlled. In 1859 he noted that solitary confinement and painful medical means as well as mechanical restraint were employed only when absolutely necessary because patients tended to regard them as punishments. The annual report for that year mentioned that violent patients were allowed to walk off their excitement in a corridor or yard under the supervision of an attendant. In general the small number of maniacally furious cases at the Asylum after 1834—in 1849 only calm patients were in residence and in 1859 there were only a few maniacally furious ones—probably facilitated the reduction of personal restraint.

MEDICAL THERAPY

In some respects medical therapy underwent a more radical revision than moral therapy. The superintendent's diary indicates that bleeding, cupping, blistering, and the application of setons lost their position as the dominant medical means for treating insanity after 1834. The annual reports, however, make it clear that these measures were never categorically rejected, although their use declined sharply in the last two decades before the Civil War. Some time in the 1840's cold shower baths were approved as "the only [medical] means to which we can conveniently resort" as a substitute for the discredited depletive methods of the past. This abandonment of the old medical techniques represented approved practice in the most advanced mental hospitals in the United States.

Renunciation of harsh medical methods, while a logical step for advocates of moral treatment, signified neither the Asylum's acceptance of Tuke's negative attitude toward medical therapy nor a rejection of somaticism. Only certain medical practices and beliefs came into disrepute, not the use of medicine itself, for in 1856 a medical committee of the Asylum gave the superintendent permission to employ a full-time apothecary. Partly on the basis of the "new" theory that insanity resulted from irritation and exhaustion rather than inflammation of the brain, the Asylum, like many other similar institutions, had by this time come to rely upon opium and other sedatives instead of depleting agents. The objectives of both methods remained the same: to subdue the violent, excited, noisy patient, make him susceptible to moral treatment, and at the same time cure the pathological condition of the "brain and its members."

The continued emphasis upon the necessity for medical treatment involved a continuing belief that insanity, as a somatic disease, was rightly the province of medicine. In 1837 the resident physician of the Asylum, Dr. R. R. Porter, complained that it was "not uncommon to hear physicians speak of insanity as purely a mental affection; and in consequence of this view . . . reject the employment of physical agents in its treatment either as hazardous or useless." There were even instances, he said, where medical men, strongly imbued with the idea that mind was independent of matter, requested the Friends' Asylum not to use medical means in treating their insane relatives. These physicians thought that medication would have no value and would only cause patients needless pain and torment. This negative approach could result in rejecting medical control of the treatment of mental illness. Porter related that:

> a manager of a celebrated lunatic institution had recently informed [him] that several years ago he and his colleagues were so prejudiced against the use of medical measures as to object even to the election of physicians on their board, being fearful they might effect some innovation.

A similar tendency among laymen was noted by Worthington in 1863. People, he wrote, often refused asylum treatment for their loved ones in a "fruitless effort to benefit the patient at home by moral remedies while the actual disease [was] permitted to go unchecked" because medicines were not used.

CONCLUSION

The changes made in moral and medical treatment from 1835 to 1861 derived less from any new theory of insanity than from trends in general medicine, pressures exerted by humanitarian reformers interested in improving the condition of the mentally ill, the influence of the British non-restraint movement, and experience.

The Asylum's shift of emphasis from bloodletting and purging to opiates, in addition to reflecting new ideas about brain pathology, paralleled the trend in the medical profession away from the bleeding and heavy dosing which had dominated general medical therapeutics for many years. The followers of French nihilism, the leading school of medicine in the first half of the nineteenth century, were skeptical of traditional practices and rejected the theoretical systems and depletive remedies of the past. This new approach, although never formally accepted by the Friends' Asylum, presumably influenced the staff physicians.

The reform movement led by Dorothea L. Dix probably affected the Asylum's practices indirectly. The humanitarian approach to the insane originally did not exclude certain kinds of severe treatment for therapeutic purposes. Although Miss Dix did not advocate non-restraint, she so effectively campaigned against the cruel treatment of the insane that unpleasant techniques of any sort became generally suspect in the eyes of the public. Even mental hospitals founded on humanitarian principles found that they, as well as the notorious jails and alms-houses, did not escape the charge of cruelty and violence towards the insane. To institutions which, like the Friends' Asylum, competed for middle-and upper-class patients, this attitude was of great concern. Such patients would be particularly fearful of entering any asylum and their friends and relatives reluctant to commit them. The Friends repeatedly sought to convince the public that patients received gentle and considerate care at their asylum, and their gradual abandonment of harsh means reflected in part the need to overcome popular fears. Also very important in this development was the influence of the successful non-restraint movement in England, which originated in the late 1820's within the British medical profession. The changes in the Friends' Asylum, as in all similar institutions, were slow to come about partly because of the difficulty of finding adequate substitutes for the techniques of personal restraint and depletion in unmanageable cases.

The humanitarian impulse that helped to effect the modifications in practice at the Friends' Asylum and elsewhere was itself engendered in large part by the high recovery rates reported in mental hospitals. The greatest impetus to the introduction of additional psychological and humanitarian techniques at the Asylum was the apparent success of moral management. Year after year the Asylum announced high percentages of patients "restored"; the usual figure, excluding remissions, was 50 per cent of the annual admissions. By the term "restored" the Friends meant the removal of disorder from the brain, that is, a mind brought back to its former condition. They thought, however, that patients noted for any "striking peculiarities" of conduct or manners prior to the onset of insanity usually retained them after recovery. Nevertheless, as long as they remained calm and rational and could function within the home environment, such patients were considered restored.

The statistics indicated, the attending physican said in 1853, that "nearly every case" might be cured if placed under care within six months after the onset of illness. The Asylum did not always view even the chronically ill as incurable; those who claimed otherwise were "too hasty in considering such cases as hopeless. It is certain, that in many instances, the peculiar irritation of the brain, from which insanity often arises, may be continued for a long time without passing into permanent structural disease."

Superintendent Worthington did recognize that not all the mentally ill could be restored, for in 1851 he declared incorrect the opinion once held that every case of less than one year's duration could be cured. He pronounced incurable those cases where structural changes occurred in the brain as a result of inflammation, where there was general paralysis, and where emotions such as fear and grief were involved. These cases and those removed prematurely comprised about 28 per cent of the patients. Thus the reported recovery rate of 72.25 per cent attained in 1851 was about the best the Asylum could hope for.

Some physicians and laymen went further than Worthington and denied the accuracy of all mental hospitals' statistics, which, they said, expressed "only opinions" colored by the wish to make as favorable a statement as possible of the results of the treatment employed. Worthington conceded that this charge might have validity. This concession to critics of asylum statistics in general was apparently not thought to apply to the Friends' Asylum, for he as well as later superintendents continued to issue figures showing high rates of recovery and to make optimistic prognoses based on these statistics. Even if the precise number of cures claimed is an exaggeration there seems to be no sufficient reason to doubt that the Friends' Asylum did achieve a fair measure of success as a consequence of employing many techniques which are producing similar positive results in mental hospitals today.

DYNAMICS IN BRAIN LESIONS[1]

WALTHER RIESE, M.D.[2]

THE PROBLEM

It is still widely believed that the so-called organic defects, above all those of memory, call for no other explanation than the destruction of brain tissue. It is the intention of this paper to show:

1) that the organic defects are flexible, that is to say, they are not irrevocable, in spite of persistent lesions;

2) that there are well defined conditions under which a forgotten knowledge may be evoked, in spite of the persistent lesion;

3) that these conditions can be expressed in terms of psychology and not in terms of anatomy or physiology;

4) that the rules to which the return of functions is subject are different from one individual to another, and in accordance with individual criteria of difficulties involved in the performance of these functions;

5) that at times, the returned functions rank highest in the history and hierarchy of human values while those serving the more elementary and primitive needs are not necessarily the first ones to be regained.

Loss of speech due to brain injury or aphasia will be used as a test object for the demonstration of these laws.

"THE OCCASIONAL UTTERANCES" OF THE "SPEECHLESS MAN"

Though Hughlings Jackson, always anxious to "leave consciousness alone," strove for a *neuro-physiological* interpretation of aphasia, he made observations furnishing raw material for a *psychological* interpretation of speech defects in brain injured persons. The "occasional utterances" of the "speechless man" are the most instructive constituents of this raw-material.

> "...Under the excitement the patient may swear ...the patient cannot repeat it, he cannot 'say' what he has just 'uttered'. Sometimes, however, a patient, ordinarily speechless, may get out a phrase appropriate to some simple circumstance, such as 'good-bye' when a friend is leaving... he cannot 'say' it again, cannot repeat it when entreated." (7, II, p. 163).

> "...A woman who could only utter the phrase 'Yes, but you know', once said 'Take care!' when a child was in danger of falling. A patient of Trousseau's said '*merci*', when a lady picked up his handkerchief. A patient of mine would, besides swearing when vexed, say 'Good-bye', when a friend was leaving him.

> "...the lady could not repeat 'Take care!' The friends of Trousseau's patient thought he was beginning to speak; but he could never repeat the word. My patient could never say 'Good-bye', except under the appropriate circumstance..." (7, II, p. 179).

It would seem that Jackson himself did not grasp the full scope of his own observations. At least, he did not derive from them all of the far-reaching conclusions to which indeed they led. The very fact that at a given moment the "speechless man" may have the knowledge and the use of a word or a sentence which, as a rule, he does not have, is not compatible with the idea of regional representations of these words or their so-called "images" in the brain and their destruction in aphasia. It simply is not intelligible that after its destruction a given area of the brain still yields the same function ascribed to the intact area, and to that area alone. Through his "occasional utterances" the aphasic demonstrates that he is able to recover a forgotten knowledge. In fact, what is at stake here is the process or the problem of *recovery* in its most elementary form. One may say that the very fact of recovery from memory defects speaks against the idea that the knowledge recovered was the sole result of the activity of an area which precisely is found to be destroyed forever.[3]

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[1] Adapted and expanded from an address delivered at the Chestnut Lodge, Rockville, Maryland, February, 1953.

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In general terms, through the "occasional utterances" the fact is revealed that no knowledge is lost forever. One is tempted to make the daring assumption that whatever existed but once in the human mind from which it apparently disappeared, can be brought back. Certain conditions, however, are needed for the recovery of lost knowledge and they were outlined by Jackson in a still somewhat cursory manner as those of "emotion" and "excitement." Evidently, these conditions are not fulfilled when the patient is asked to repeat the same word or the same sentence he just uttered spontaneously in emotion or excitement. Here we grasp the difference between life and experimental situations. The limits of testing are embodied in the different results in a most reduced fashion. In addition, the inability of the brain-damaged person to abstract or to detach himself from a concrete situation (K. Goldstein), to "venture on the high seas of the possible" (Cassierer) instead of clinging to reality, his inability to perform acts meaningless in themselves or to talk nonsense indicate that these remain the privilege of the normal individual.

APHASIA IN POLYGLOTS

According to the "Law of Pitres," aphasics, who were able to speak several languages, may regain the use of one of them, while the others are lost. In most instances, the native tongue or the language most frequently used and most fluently spoken is restored, but there are exceptions to the rule.

The aphasic may regain the language on which he concentrated at the time of the attack, though that language was neither necessarily the most familiar to him nor even his native tongue. Thus, say, he used to speak German with his wife, but he spoke French with the physician who attended the attack, and who subsequently determined the patient's linguistic attitude from this moment on (8). A polyglot aphasic spoke only German when discussing certain political topics studied and treated by him previously in that same language (2). In still another instance, only Greek and Latin were preserved, presumably because the learned aphasic acquired the knowledge of the humanistic languages by means of written symbols affording in their turn a visual assistance in the return of these languages (14). Apparently, for similar reasons, polyglot aphasics of Swiss nationality may regain first the use of High German, though the Swiss dialect is, as a rule, more familiar and closer to them (12). To be sure, emotional and instinctive factors and the imperative need for communicating with the surroundings are also at work in the selection of the language regained by the polyglot aphasic.

It has been noted that in exceptional conditions, such as epileptiform attacks or delirious states, a repressed language may suddenly be released. Personally, the writer has witnessed a schizophrenic speaking French immediately after a convulsive shock treatment; during the war he had spent the happiest time of his life in France, but had spoken French neither before nor since. A convulsive shock certainly produces micro-changes in the brain, though as a rule, reversible ones. It was during this *organically* induced state of release that the patient recovered a language to which he had strong *emotional* ties.

The problem here discussed was raised for the first time by Montaigne in one of his "Essays":

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[3] It is of no help to turn to the famous "taking over" of the lost knowledge by another area. The latter may be understood either to have participated in the lost function or only assumed its new physiological significance after the destruction of the originally specific area; in both instances, the principle of specific functions rigidly related to specific areas is abandoned.

> "Latin is to me like a native tongue; I understand it better than French. But for these forty years past I have made no use of it either for speaking or writing. And yet on two or three occasions in my life, under sudden and violent emotion (once, when my father, although in good health, fell back into my arms in a swoon), the first words I uttered, coming from the depth of my heart, were always in Latin; Nature, in spite of so long a disuse springing up and finding forcible expression. And this is said to have occurred to many others" (Book III, Chap. II, p. 264), (13; 23).

Unless one turns to the unintelligible hypothesis that in a polyglot individual each language is represented in an individual and specific area of the brain and that just this area is destroyed or recovered, one has to admit that the selection of the spared or regained language is made according to behavioristic or psychological but not to anatomic principles.

PINEL'S CASE[4] (1809)

> "The loss of memory which almost always succeeds apoplexy, might be limited to the terms by which we express ideas. After an apoplectic attack, a notary forgot his own name, that of his wife, children and friends, though the motility of his tongue was in no way affected; he could neither read nor write. Nevertheless, he seemed to remember the objects related to his profession. He pointed with his finger to the folders containing records and contractual engagements which had not been located and he also showed by other signs that the sequence of his thoughts was intact."

The shortness of the clinical history and the rather cursory manner in which the case was analyzed by the eminent alienist, admits of no conclusive classification, though one might venture to interpret this type of aphasia in general terms as a nominal defect or in still more general terms, as a disorder in *evocation*. But whatever interpretation one might adopt, it remains true that the preserved knowledge referred to the patient's profession, apparently ranking higher in the hierarchy of individual interests and ties than the names of his immediate surrounding.

THE AUTHOR'S CASE[5]

A. S. was 42 years of age when the first symptoms of Parkinson's disease appeared. He was 58 years old, when he was submitted to a neurosurgical relief operation with the purpose of abolishing the tremor on the right. For a period of about three days he lost completely the use of spoken language. His understanding of spoken language, however, was perfect. Immediately, when he began to talk, it was a strange language. *He was very witty, learned and used very long, technical and Shakespearean words and never said anything simple.* At one occasion when being disturbed by the talking of his surroundings, he indicated by an appropriate gesture that he wanted silence; he went to sleep for a few minutes, and when he woke up pronounced the following sentence: "Voluntary silence, terminate." When assisted by a not too skillful nurse, he made the following utterance: "methinks the lady doth protest too much" (quotation from Hamlet). When the nurse left the room, he turned to his wife saying, "scientific inaptitude." When people in his room were discussing a political figure in the State scene, he suddenly summed it all up by saying, "vituperative old man." He surprised his surrounding by his regular use of unusual words which were always apropos, though he spoke very little. His speech was sparse; it was a thrifty use of the best language. On the way home from the hospital, where the operation had been performed, he passed a funeral cortege and he said, "There, but for the grace of God, go I." This way of expressing his thoughts lasted a few months. During this time he never mispronounced any words. It is impossible to say whether he experienced difficulties in naming since he spoke so little, but he always recognized everything, nor did he experience any difficulties in following conversations. About one month after the operation, his wife resumed reading the editorials of newspapers to him, a progressive daily paper, scientific monthly articles, not only dealing with his own but also with related general scientific subjects, particularly new drugs in which he had always been interested. In the course of his illness, he became quite an authority in poisons

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[4] Adapted from the present writer's translation (15).

[5] Adapted from the author's paper (17).

> (always with the view to the terminating of his life). He himself read some, but became easily tired because his head dropped forward and he could not turn the pages with his paralyzed arm. He also dictated letters to his children every week. He also continued looking after his financial affairs which he handled in the same intelligent and careful manner as before, and he also handled the affairs of other people.
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> His main interest in his life were science and social welfare and the betterment of social welfare through science. He had many original ideas as to the attainment of this goal. Among his favorite authors Mark Twain and Dickens stood out prominently, but he also knew Shakespeare thoroughly. This went back to his youth where he did voluminous reading because of his frailty as a boy. He published numerous scientific papers, but wrote also many satirical sketches on affairs of the day.

Thus, after a brief initial period of complete loss of speech, language, though still scanty and slow, became formal, solemn, poetical, dramatic, pathetic and "Shakespearean," the patient frequently using quotations. To understand the type of aphasia, we must turn to the individual affected; his life, his nature, character, training, ambitions, endeavors and achievements. Scientist and academic teacher by vocation and choice, early training and contact with scholars, he lived and thought in an elevated spirit, and he evidently repudiated a more simple and a more ordinary view of life and human nature. His philosophy seemed so deeply and so firmly rooted in his personality that the noble and solemn manner of expression finally became less vulnerable than the ordinary and simple formulas in common use. These disappeared from his vocabulary while the former survived. What brain injury brought to the fore was that element in his nature which disease could not destroy but rather release. The best representatives of psychiatry of the romantic era thought that man's true and eternal nature, his "drive for the infinite" (6) manifested itself even in disease, more specifically in mental illness; the latter still revealed, they believed, what is great and noble in man though, perhaps, in a distorted and unproductive fashion.

K. Goldstein (1, I, p. 787) is inclined t consider the patient's utterances as no mor than isolated automatisms. Though acknowledging the fact that they reveal th premorbid character of the personality, they belong only, he concludes, to "quasi-high" behavior, once the individual is afflicted b disease or injury evidently marking in this view a true disrupture between two chapters in the biography of the same individual. It remains true, however, that these so-called automatisms are highly *selective,* in accordance with the patient's intellectual standard, education, training and literary preferences. These "automatisms" sprang from a soil which throughout the disease did not cease to be that of a noble, austere and pathetic nature; thus they were not isolated but rather integrated phenomena embedded in an intellectual and emotional atmosphere of their own. The situation is different in those cases in which symbolic phenomena or a poetic style make their *first* appearances under the sole influence of injury or disease. Moreover, one might wish to know the *criteria* admitting of a distinction between high and "quasi-high" linguistic behavior. These criteria which imply a system of values, can only be sought in the inner structure and level of organization of the language itself, regardless of the conditions under which it appears. In trying to reach these criteria, we would have to relinquish psychological terms and methods and to invade esthetics.

THE INTERRELATION OF STRUCTURE AND FUNCTION REMAINS UNKNOWN

What obviously emerges as a common element from all these observations is the *lawful* nature of the effects of brain disease and brain injury. Of course, the fact of injury to the tissue has to be taken for granted. But it does not paralyze the inquiry into the laws presiding over the effects of brain lesions or their psychic dynamics. Nor should it paralyze therapeutic action planned according to the dynamics at work in each individual case. Though the rise of anatomy in the Renaissance and that of neuroanatomy and neuropathology in the last century meant an unheard increase in factual knowledge and facilitated the scientific conquest of the human frame, the true relation between structures and functions or body and mind remains as unknown as in antiquity. In this respect, it is significant that Leonardo da Vinci, who must be credited with one of the first faithful descriptions and, above all, illustrations of the human body, did not use the new and vast knowledge he owed to dissections for a reshaping of the conception of disease; he still adhered to the Platonic idea of a discord of the elements and, evidently, he did not allow the structures studied and drawn by him to enter his concept of disease which remained a cosmological one.

All too frequently we allow ourselves to be overwhelmed by anatomical findings, as though we were bound to abdicate the search for functional analysis as soon as destruction reaches beyond microscopic size. But are we ever sure that the brains of our patients are totally free from anatomical changes, slight as they might be? Does this prevent us from treating them psychologically? And where are the limits? Should it be true, as an eminent contemporary clinician said, that in the final analysis the difference between "functional" and "organic" threatens to be no more than a difference in magnification? The patient's call for assistance induces us simply to disregard their brains affected by lesions, or not. We may be encouraged in our decision to understand and to treat the effects of brain lesions by psychological means by considering that anatomical findings are not constant and that they are not necessarily in proportion to the functional disturbances with which they are found to be associated. Von Monakow's so-called negative cases of brain lesions with no corresponding symptomatology, and vice versa, represented one of the most disappointing chapters in the history of the doctrine of cerebral localization.[6] Man, as a species, makes the greatest achievements (upright position, handedness and language) with his brain still unfinished. Man, as an individual, makes his greatest achievements (the mature results of experience and thought) with his brain already aging. Though it remains true that, as a rule, the brains of individuals affected by senile dementia display severe destruction, some do not and, on the other hand, the brains of old people may show destroying effects, in spite of intact mentality. The brain of a 107-year-old man (26), suffering from senile dementia for 11 years, did not reveal major signs of cerebral aging. The brains of two eminent scientists (20), who died in advanced age, showed signs of cerebral aging or destruction, though only mild ones; but both individuals were in full possession of their outstanding mental capacities at the time of death.

THE LAW OF TIME

One of the main reasons why the interpretation of brain lesions has been a mechanic rather than a dynamic one, has been the total neglect of one of the basic constituents of disease and the effects of injury, namely *time*. Ever since the days of the Greeks, diseases have been studied and treated according to stages. There was a period in medical history when the choice of the decisive hour for a successful treatment was given an almost mystical importance (Paracelsus).[7] Overpowered by the ever-increasing intricacies of anatomical arrangements, resisting any other than purely static and diagrammatic interpretation of the effects of brain disease, yielding in this self-inflicted intellectual emergency to the always threatening danger of over-simplification, the modern student of brain lesions forgot that every functional disturbance has its *natural* or *evolutionary history*. Whether affected by neurosis, psychosis or brain injury, man must write the history of his new condition which implies the history of his whole life. Nobody, healthy or not, can escape the law of time and change. *In fact, it was not the tremendously improving anatomical knowledge as such which was responsible for the neglect of the chronological nature of brain disease and injury in the last century, but the new and unjustified role ascribed to the structures, namely to be the sole producers of functions and symptoms.* Should we succeed in readopting the Aristotelian view of structures as purely *instrumental* in life, we could still save the imposing body of anatomical knowledge but, at the same time, leave to the manifestations of life, disturbed or not, their proper characteristics and criteria, that is, their histories. In this respect, psychoanalysis has been more humanistic than neurology, the history of neurosis being one of Freud's primary concerns and fundamental achievements (21).

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[6] The writer was able to explain some of these negative cases by the small momentum of the lesions (16, 18, 25).

[7] "Then only the course of nature and art is fulfilled and not before, unless the time has arrived" (9, p. 58).

In experimental neurophysiology Sherrington was the first to study and to describe the effects of stimulation in terms of time. It was C. v. Monakow, who, for the first time, traced the natural history of brain lesions. The following facts may have no immediate bearing on active treatment, but, to say the least, they cannot be ignored by an intelligent care for patients affected by destroying brain lesions. At the initial stage, symptoms resulting from *sudden* lesions are much more severe and widespread than at the residual stage. In other words, if the patient survives, the scope of functional damage becomes restricted and the liberation of initially paralyzed activities progresses gradually. Again, we discover *natural recovery*, revealing basic dynamics in brain lesions, namely the return of activities according to their ages, that is the time at which they were acquired in life, the difficulty with which they are performed, but also the psychologic mechanisms involved.

THE DUALISTIC APPROACH TO MENTAL DISTURBANCES: THE END OF AN ARGUMENT

Should it be true, as we have tried to show, that the effects of destroying brain lesions are submitted to the influence of time, situation and structure of the individual affected, the problem arises whether or not treatment in psychological terms is indicated in brain injuries and so-called organic psychoses. The problem is challenging and, in my knowledge, Schilder's bold attempt to submit general paretics to psychoanalysis, still remains the only one of its kind. But active psychotherapy of organic conditions may lose much of its provocative nature by scrutinizing the thought processes involved in those cases in which the physician intends and actually attempts to treat psychical disturbances by physical means. Is this possible and is this truly what he achieved?

The physician believing in physical sources of mental disturbances and in their physical treatment, cannot prevent himself from simply disregarding these sources *as soon as he addresses the patient as an individual.* We here discover a sudden passage from one method of thought to another[8]

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[8] A similar passage is conspicuous in all attempts to explain physiological disturbances by psychological factors. Freud (4) assumed that he had found the solution of the age-old problem of the psychogenesis of hysteric paralysis. Did he really find it? If the concept "*arm*" is attached, he said, to an association of great affective value, it will be inaccessible to the free play of other associations. The arm will be paralyzed in proportion to the persistence of that affective value.

Here we witness the *ambiguity* of the term association and the passage made subreptitiously from a purely mental to its *anatomical* meaning. But what may be severed in the mind, may not necessarily be severed in the body. The inacesthough, as a rule, the physician is not aware of it. But this passage reflects only the same change in method which we adopt when communicating with our fellow human beings, trying to explain their behavior as individuals. Their specific physiologic processes, mostly unknown, do not enter the chain of thoughts leading to their present behavior as the final link, since the physiological process itself is unrelated to the chain of psychic events, their specific nature and direction. The individual, mentally disturbed or not, makes and communicates his experiences in their proper (namely, psychical) terms which do not betray the physical ground from which they spring or with which they are associated. In fact, no immediate experience teaches us which cerebral or glandular activities are involved, when we are in the states of love, hate or anger; we know these states only by their psychical face-values.

But do we not admit psychic effects of purely physical happenings? In fact, subreptitiously, we translate the crude fact of the disturbed physical integrity into the language of coordinated psychic processes. We anticipate or we postulate that the psychic processes associated with the physical processes follow the specific directions implied in the history of the individual, his neurosis or psychosis. *It is not intelligible that purely physical or traumatic procedures have therapeutic effects on psychic disorders, unless these procedures are thought to be succeeded or actually succeeded by psychic ones apt to reinforce the stream of thoughts and emotions flowing towards* an as yet unknown future, which, we trust, will bring *improvement* if not cure to the patient.

The analysis made here of the two methods of thought involved, and its use for overcoming the difficulties implied in the opposition of the physical and psychical, is very different from certain contemporary tendencies which try to escape the intellectual emergency arising from this opposition simply by postulating the famous unit of soul and body and by promptly treating the patient through both physical and psychical means at the same time. I understand that the psychotherapist meets the patient on purely psychical grounds and does not allow prescriptions to enter the planning and inner organization of his psychical approach; nor is the patient, as soon as he is drawn into the orbit of educational and diplomatic influences and given responsibilities, allowed to retreat behind presumable or actual effects of drugs. It is true, of course, that the patient is a unit of soul and body, a statement conveying no great substantial knowledge as long as we have no precise idea of the nature of this unit—an idea we will hardly ever reach. It has been said that "physical" and "psychical" are but two aspects of the same organism. This statement, however, does not eliminate the difference between the two "aspects." The spatial character which distinguishes physical and physiological manifestations is denied to psychical ones. After all, the patients themselves experience the difference unmistakably. Neither does the assumption of an identity lying behind the two different aspects eliminate the difference in method of thought with which we approach each of them. Nor does the assumption imply the conclusion that by addressing one of the two aspects we necessarily reach both of them. The unit I have in mind, and to which one turns in psychotherapeutical dialogue is, to use Benjamin Rush's term, the unit of "the human figure." This is understood to be the history of a man's emotions, their effects on his decisions, past and present,

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sibility of a concept must not be identified with that of its presumable physical substratum. Granted that my arm ceases to be part of the *inner* experience of my body, paralysis, defined as a loss of movement, must be explained in terms of movement, *i.e.* external experience. It still remains a mystery why a patient can no longer raise his arms at will just as it remains a mystery why a healthy person can do it. We are only allowed to pass from one *thought* to another.

interhuman relations and man's shortcomings and successes, in brief, the history and structure of the personality as it emerges as the result of the physician's own integrating thought.[9]

To stress it once again: the physician passing from the physical genesis of mental *disease* or behavior to action aimed at the diseased *individual,* truly passes from one method of thought to another; in fact, he passes from one concept of disease to another. The search for the sources of mental disease implies etiologic and anatomical concepts and these do not promise a view of disease as a coherent whole, subject to the laws of time and revealing order and direction. In fact, whenever the physician tries to obtain this view, he turns to historical, biographical and psychological concepts. He can leave it undecided or as irrelevant for the time being, which etiologic factors, pathogenic mechanisms or regional structures may be responsible for a condition whose inner content and coherence alone are at stake in his embracing view.[10]

In brief, the physician turning to physical agents, to bring about a change in the mental condition of his patient, simply relinquishes the view of disease as a coherent whole, subject to the intrinsic rules of mental life. He adopts the etiologic concept and thinks in terms of physio-pathologic mechanisms rather than in terms of biography. Drugs, shocks or psycho-surgical interventions cannot be included in the chain of intelligible links holding together that evolutionary history which we call mental disease. It is the crudeness of matter and physical agents at large, foreign to animated life and human conscience, which makes these agents unfit substitutes for truly biographical events whose continuity they rather disrupt.[11] We conceive them only as instrumental in promoting or facilitating mental experiences which, we trust, will emerge after the administration of physical agents to become constituents of the biography and determine a happier course. Thus, we relinquish the etiologic concept in its turn and subreptitiously reconstitute the inner structure of the disease as the coherent whole of inner experiences; again, we pass from one method of thought to another.

To conclude, we do not give up the distinction between the physical and the psychical; nor do we simply and dogmatically postulate their unit. Instead, we disclose the alternative use which human intelligence perpetually makes of two methods of thought, according to needs, both of them embodying different concepts of disease.

Thus comes to an end the famous controversy of those believing in somatic sources of mental disease against those believing in psychogenesis. The "somatic" conceived as a regional lesion, trauma, drug or surgical intervention, all of them equally foreign to the nature and history of the inner experiences of the patient, cannot be made truly active constituents of the history of life and disease. But by bringing their immediate effects, crude and unrelated as they are in themselves, into inner relation with the whole history and evolution of the individual, can we hope to influence the course of inner experiences by physical means. But then we fall back to psychotherapy, and the physician bringing the crude effects of brain lesions, natural or artificial ones, in line with the patient's biography, as does psychotherapy of organic conditions.

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[9] Adolph Meyer strongly emphasized the soul-body unit or the "psychobiologic" nature of the individual, defined by him occasionally as a "body in action." It is significant that his analysis of an individual's behavior (ergasia) was made almost entirely in terms conveying purely mental contents and states. Though one agrees that our image or concept of a concrete person is not devoid of physical constituents, be it only vague ones, the *fragments* or organs of this person, his vessels, glands or brain, believed to be sources of his abnormal behavior do not appear as such in the *synthetic* view of the patient as an individual; it is this view which remains the springboard of therapeutical behavior.

[10] The same thought was in the mind of Moreau de Tours (10, 11) when he identified the inner experience of insanity with that of dream, regardless of the different physiological causes acting in both of them.

[11] It is the physician's primary purpose *to understand* the patient. Indeed, how could there be an intelligent treatment without this preliminary task fulfilled to satisfaction? Understanding is reached by tracing back the actual behavior to its roots. Since both actual behavior and roots are expressed in terms of inner or *psychic* experiences, the abrupt insertion of an isolated physiological effect could only endanger the laborious effort of successfully completing the unfolding of the roots, thus endangering understanding. Should it be true, as one maintains, using statistical rather than psychological evidences, that the physiologic effects of drugs, shocks, or surgical interventions may in themselves make history, promote lasting change and cure, *regardless of their integration into the history of disease*, the mechanism of cure would be beyond the reach of human intelligence, namely causal thinking, thus *miraculous*. But miracles have no room in a system of an intelligible and teachable medicine.

DYNAMICS OF BRAIN LESIONS ANTICIPATED BY FREUD

Freud adopted Jackson's interpretation of speech defects as a dissolution of a highly evolved mechanism. By conceiving them at the same time as early and simple stages which are preserved, whereas the recently acquired and more highly evolved system of associations is lost (**3**, p. **89**), Freud did not remain within the strictly physiological limits of the Jacksonian principle. Here may be the sources and first versions of his ontogenetic and perhaps even his phylogenetic approach, which was foreign to Jackson's doctrine of evolution and dissolution of nervous function. Freud listed the remaining fragments of speech in aphasics and the preservation of the mother tongue in polyglots (**3**, p. **62**) as incompatible with the purely anatomical interpretation of aphasia. But he also listed observations illustrating early training as a principle of selection in preservation of speech, the bearing of profession and education on each individual speech defect, the intensity with which the last utterance was made, and thus allowed to survive loss of speech, the preservation of automatic series, such as successive numbers, days of the week, months, etc., in spite of the inability to pronounce a single number of the series. Moreover, he stressed the effect of fatigue, that of the reduction in the duration of sensory impressions, fluctuating and erratic attention. Most remarkable was his assumption that cerebral structures may react in their *totality* to incompletely destroying lesions; the resulting disorders may be identical with those produced by non-organic damage (**3**, p. **32**). In sum, Freud was perfectly aware of the dynamics involved in brain lesions (**23**).

Freud must be considered as one of the earliest representatives of that school of neurological thought which did not refrain from interpreting psychic disorders, resulting from destroying brain lesions in their own and original, namely psychic (or psychologic) terms. It is not only remarkable that Freud yielded territory, for the first time, in his "Aphasia" to psychology and psychopathology; but that he did it while still a neuropathologist. But a still more significant anticipation of his future development is to be found in the same treatise. Freud rejected the doctrine of cerebral localization of *functions*, ranking himself with the first ones to admit only of a localization of lesions or, as he put it, to leave to the speech region its sole significance from the point of view of morbid anatomy, but not in respect of normal function. This denial of a regional representation of allegedly isolated and elementary functions leads to the inescapable conclusion that he conceived each function as related to the activity of the brain as a whole. This view was indeed implied in his interpretation of initial but transient speechlessness to which he ascribed no diagnostic significance, and which he explained by the "shock to the apparatus which had previously been working with all its resources"; thus he anticipated Monakow's doctrine of diaschisis.

If anything stands out as characteristic of psychoanalysis, it is its principle to consider and to interpret each symptom as the expression of the individual's whole history or biography. In this interpretation is embodied the same general tendency which led Freud in his "Aphasia" to reject a punctate localization of function or an isolation of one part or function from the rest. At first approach the various "complexes," he described, seem to contradict the integrative nature of an individual's behavior, but evidently each complex was intended to remain a fully integrated and purposeful type of behavior not unlike the reflex which emerged from the work of Sherrington as the final outcome of the activity of the whole organism.

Anticipations of psychoanalytic views were mentioned by Stengel in his introduction to the English translation of Freud's "Aphasia." Stengel rightly recalled Freud's interpretation of paraphasia. The critical passage in Freud's treatise reads, Stengel said, "... like a prelude to the chapter on errors and slips of the tongue in 'Psychopathology of Everyday Life' " (5, p. xiii).

But what in this writer's opinion was of greatest significance for the "Dynamics in Brain Lesions," was Freud's conclusion that his conception of paraphasia "as a purely functional symptom, a sign of reduced efficiency of the apparatus of speech associations does not exclude that it may occur in most typical form as organic focal symptom" (5).

Here then was adopted for the first time the view according to which the organic genesis of a given symptom does not interfere with the undeniable fact that the same symptom remains subject to the physiologic and psychologic laws presiding over the appearance of symptoms at large.

THE REVIVAL OF BIOGRAPHY

When independent and observational medical thought emerged from magic and priest medicine, diseases remained strictly individual, unique, indissolubly related to seasons and places. The first case histories embodying this view are to be found in the Corpus Hippocraticum (Epidemics). They are no more than biographies, listing, it is true, the signs of deranged life but simply as a disturbing chapter of an individual's biography with the main if not the sole purpose of foretelling the outcome, just as the spectators of a Greek tragedy, moved by fear and pity, must have anticipated crises and solutions.

Should we not be inclined to derive the eminent role, given to *prognosis* in Hippocratic medicine, from the tragic sense of the Greeks, the high and divine spirit embodied in the art of forecasting the still unknown rather than from their actual lack of anatomo-physiologic knowledge, though one will not underestimate this factor (**24**)? Even the greatest body of information may remain dead knowledge until the general atmosphere or the spirit of the hour have become favorable to its use. What distinguishes modern medicine from ancient medicine is *diagnosis* based to an even greater proportion on the affections of regional structures and the functional disturbances related to them. The mental operation involved in this step implied an increasingly generalizing thought. Necessarily, the individual was in danger of becoming a more or less anonymous figure behind the apparel of objective examination. This was and still is inevitable, though only as long as diseased man remains an object of generalization. But it seems that this thought process did never come to its end. When needed, we fall back to the purely biographic approach, revoking, so to say, the history of medical thought. In fact, no stage in the history of human thought is left behind forever and all stages live side by side at every moment, though not with equal power (**19**). As soon as we are forced to establish interhuman contact with the patient to save or to construct the continuity of his inner experiences, we give up regional diagnosis, simply to be, once again, biographers.

REFERENCES

1. *American Handbook of Psychiatry,* Arieti, S., ed. Basic Books, New York, 1959.
2. Balint, A. Bemerkungen zu einem Falle von polyglotter Aphasie. Z. Ges. Neurol. Psychiat., **83:** 277–283, 1923.
3. Freud, S. *Zur Auffassung der Aphasien.* Deuticke, Leipzig, 1891.
4. Freud, S. *Collected Papers,* Vol. 1. Hogarth Press, London, 1950.
5. Freud, S. *On Aphasia.* International Universities Pr., New York, 1953.
6. Ideler, K. W. *Der Wahnsinn in seiner psychologischen und sozialen Bedeutung erläutert durch Krankengeschichten.* Schlodtmann, Bremen, 1848.
7. Jackson, J. H. *Selected Writings.* Hodder & Stoughton, London, 1932.
8. Kauders, O. Über polyglotte Reaktionen bei einer sensorischen Aphasie. Z. Ges. Neurol. Psychiat., **122:** 651–666, 1929.
9. Leidecker, K. F. *Volumen Medicinae Paramirum.* Johns Hopkins Pr., Baltimore, 1949.
10. Moreau de Tours, J.-J. *Du hachisch et de l'aliénation mentale.* Fortin, Masson & Cie., Paris, 1845.
11. Moreau de Tours, J.-J. *La psychologie morbide dans ses rapports avec la philosophie de l'histoire, ou de l'influence des névropathies sur le dynamisme intellectuel.* Masson, Paris, 1859.
12. Minkowski, M. Sur un cas particulier d'aphasie avec des réactions polyglottes, de fabulation et d'autres troubles après un traumatisme cranio-cerebral. C. R. Congr. Med. Alien. Neurol. France. Clermont-Ferrand, 1949.
13. Montaigne, M. E. Of repentance. In *Essays of Montaigne.* Oxford, London, 1935.
14. Poetzl, O. Aphasie und Mehrsprachigkeit. Z. Ges. Neurol. Psychiat., **124:** 145–162, 1930.
15. Riese, W. The early history of aphasia. Bull. Hist. Med., **21:** 322–334, 1947.
16. Riese, W. Aphasia in brain tumors, its appearance in relation to the natural history of the lesion. Confin. Neurol., **9:** 64–79, 1949.
17. Riese, W. Type, evolution and localization of aphasia following neurosurgical relief in a 60 year old scientist affected by paralysis agitans. Confin. Neurol., **9:** 216–225, 1949.
18. Riese, W. *Principles of Neurology in the Light of History and Their Present Use.* Nerv. & Ment. Dis. Monographs, New York, 1950.
19. Riese, W. *The Conception of Disease, its History, its Versions and its Nature.* Philosophical Library, New York, 1953.
20. Riese, W. The cerebral cortex of two prominent scientists in advanced age. J. Exp. Neurol. Neuropath., **12:** 92–93, 1953.
21. Riese, W. The pre-Freudian origins of psychoanalysis. Lecture delivered to the Academy of Psychoanalysis, May 12, 1957. In Masserman, J., ed. *Science and Psychoanalysis: I.* Grune and Stratton, New York, 1958.
22. Riese, W. Petit traité de l'interrogatoire suivi d'observations faites dans l'interrogatoire des malades privés de l'usage de la parole (aphasie). Encephale, **46:** 437–467, 1957.
23. Riese, W. Freudian concepts of brain function and brain disease, their sources, scope, and evaluation. J. Nerv. Ment. Dis., **127:** 287–307, 1958.
24. Riese, W. *A History of Neurology.* M.D. Publications, New York, 1959.
25. Riese, W. Das Momentum der Hirnläsionen: Eine Nachuntersuchung. Schweiz. Arch. Neurol. Psychiat., **84:** 172–179, 1959.
26. Riese, W. and Zfass, I. S. Cerebral cortex of a man with senile dementia believed to be 107 years old. Arch. Neurol. Psychiat., **51:** 78–83, 1944.

LOCALIZATION OF AUDITORY MIDLINE AND REACTIONS TO BODY TILT IN BRAIN-DAMAGED CHILDREN[1]

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The search for behavioral effects of brain injury has usually been guided by either of two assumptions: 1) that localized lesions will produce effects not found with lesions elsewhere in the brain; 2) that damage anywhere in the brain will produce general effects, and that it is size rather than site of lesion that determines the degree of deficit. The first view is supported by many studies, particularly of focal brain injury which can result in strikingly specific effects. Thus, wounds in the central visual system produce circumscribed and persistent scotomata in the visual field. The latter view, stressing general effects of brain injury, irrespective of site, is best represented by the deficits in maze running in rodents (6) and by the claims of Goldstein (5) for ubiquity of figure-ground disturbances in brain-injured man.

Like most dichotomies, that of specificity *vs.* generality may require revision. Recent studies in this laboratory of more than 200 adults with penetrating brain wounds have shown that these lesions produce specific as well as nonspecific effects, "and that the two kinds of symptoms exist together in the same group of patients" (8, p. 188). In fact, by appropriate analysis of a single task, it is possible to show both kinds of symptoms. This task involved the setting of a luminous line in the dark during body tilt (9, 10). As has been shown long ago by Aubert (1), normal adults, when tilted about 30° to their left or right, tend to make constant errors in setting a luminous line to the vertical. These constant errors depend on the direction of their tilt. When tilted to their left, they tend to displace the luminous line to their right, and conversely. According to Teuber and Mishkin (10), *Ss* with gunshot penetration of the anterior third of the brain substance tended to overshoot the vertical, under these conditions, even more than the normal controls or *Ss* with penetration of the posterior third of the brain. In this respect, the results of this experiment disclose a specific effect.

Displacement of the line opposite the side of tilt is usually interpreted as an overcompensation for the tilt of the body, and it would seem that damage to the anterior third of the brain leads to an exaggeration of such a compensatory effect. It cannot be said, however, that this specific manifestation makes the brain-damaged adult more childlike. Developmental studies of the same phenomenon by Werner and Wapner (13) and its auditory analogue (*i.e.*, the setting of a sound source to the subjective midline) by Teuber, Liebert and Rudel (7, 9) have demonstrated that displacement of the visual vertical (or auditory midline) to the side opposite body tilt *increases* with age. For vision and audition, the error grows from virtually zero displacement, at about age five, to the displacement normally seen in adults; this is reached by late adolescence. In this sense, it might be said that adult brain-injured *Ss* with frontal damage go beyond the adult norm, while children remain below this norm.

The picture is quite different with regard to a more general effect of brain damage, or, in this task, the starting-position effect. This effect is observed by noting to what extent S's response is influenced by the initial position of the line (or sound) on each trial, independently of the direction of his body tilt (see procedure, below). Teuber and Liebert (9) demonstrated that *all* adult brain-damaged *S*s, regardless of classification by locus of injury, showed larger starting-position effects than normal controls. For starting-position effects, at least, brain injury does appear to make adult *S*s more like normal children, for both Werner and Wapner (13) and Liebert and Rudel (7) report largest starting-position effects in their youngest normal *S*s, with the effect diminishing to about half by late adolescence.

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Inquiry into patterns of developmental change thus may shed some light in differences underlying specific and general effects of brain damage. A further question arises as to the course of development for these diverse aspects of performance when brain damage is present throughout life. In addition, one might ask the following more specific questions:

1) Would children suffering from CNS damage show the same effect of posture on localization as do normal children? Would differences tend to be quantitative or qualitative, *i.e.*, would the amount of error run ahead (as in adult *S*s with frontal lesions (10)), or lag behind, or would there be an altogether different pattern?

2) What about the starting-position effect? Would this tend to run ahead, lag behind (as with all of Teuber and Liebert's adult brain-injured *S*s (9)), or show a different developmental trend in brain-damaged than in normal children?

3) Would amount or type of errors depend on the presumed amount or type of CNS damage?

4) Might the effect depend on the intelligence level of *S*, *i.e.*, could mental retardation as such account for any obtained differences between control and brain-damaged *S*s?

TABLE 1

Distribution of Ss by Age and Symptoms

Age	Spastic	Ataxic	Athetoid	Miscellaneous
5–7	6	3	3	0
7–9	6	2	3	1
9–11	7	1	4	0
11–13	6	1	3	2
13–15	5	1	4	2
15–17	6	0	4	2
Totals	36	8	21	7

To answer these questions, an investigation previously conducted with 72 normal *S*s, ranging in age from 5 to 17 years (7), was repeated with 72 children of the same ages who carried neurological diagnoses of "cerebral palsy." These brain-damaged *S*s were matched with normal *S*s in terms of sex and chronological age, to provide answers to questions 1 and 2. Answers to questions 3 and 4 were sought within the pathological group. The auditory analogue to the setting of the vertical rod was the experimental condition used. In this experiment (9) *S* tells *E* when an ambient sound, passing in the coronal plane, is exactly "in the middle." A normative study by Liebert and Rudel (7) has demonstrated that the effect is analogous to the setting of the visual vertical and shows the same developmental trends.

PROCEDURE

SUBJECTS AND METHOD

*S*s were 36 boys and 36 girls, ranging in age from four years 11 months to 18:0 years. They were selected from among the several hundred day students of the Roosevelt School (for "cerebral palsied") in Roosevelt, L. I., Nassau County, N. Y.[5] Some *S*s were able to walk unaided, others were con-

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[5] The authors are indebted to the staff of the Roosevelt School, Roosevelt, L. I., for help received in making the children available.

TABLE 2

Further Classifications of Brain-Damaged Ss

Age	Impairment		IQ		Hemi-plegics
	Mild	Severe	44–85	86–136	
5–7	6	6	5	7	1
7–9	7	5	5	7	3
9–11	6	6	7	5	2
11–13	6	6	8	4	1
13–15	6	6	8	4	0
15–17	6	6	7	5	1
Totals	37	35	40	32	8

fined to wheel chairs, but all could sit erect. Children with demonstrable hearing loss were not used. Neurological diagnoses were distributed as shown in Table 1. There were no late-injury cases among these children. All disabilities were considered to be the result of prenatal defect, birth trauma, or encephalopathies acquired during the first year of life. The severity of impairment was classified by examining neurologists as mild, moderate, or severe. To make a twofold distribution of this, those dagnosed as "moderate" were judged to be mild or severe, depending on (*a*) number of limbs involved, (*b*) speech impairment, and (*c*) ability to ambulate and manipulate. On this basis the groups were subdivided as shown in Table 2. Also included in Table 2 are the reported intelligence quotients. Since there was no correlation between severity of neurologic impairment and intelligence, the *N* in each subgroup does not necessarily represent the same *S*s. All but eight *S*s had impairment involving both sides of the body. The eight hemiplegics were not evenly distributed among the age groups, as can be seen from Table 2.

The IQ range was 44 to 136, the mean IQ 82.9 (SD = 20.7). Except in cases of severe speech impairment, intelligence testing was done by the staff psychologist at the Roosevelt School with the Stanford-Binet Form L or M. Children with little or no speech were tested with the Columbia Maturity Scale. Control *S*s were normal children, mainly residents of Cape Cod (7). No estimates of their intelligence are available, but all were in normal grade placement at school.

*S*s were first instructed, then blindfolded and led into the experimental room. Each was helped into the tilting chair to which the sound source was attached, a single PDR-10 phone emitting 1 millisec. clicks generated once per sec. The phone could be moved in an arc in *S*'s coronal plane, at a constant distance of 12 in. from the occipital pole. Each *S* had a total of 12 trials under each of three conditions, *viz.*, upright, tilted 28° to the left, and 28° to the right. The order of body tilt conditions was varied from *S* to *S*, so that each of the six male and six female *S*s in any age group was exposed to a different sequence (there being six possible sequences of these three conditions). Under each condition, the sound was presented by *E* alternately to *S*'s right and left at 10° and 30° from the objective midline. These four starting positions were used in random order for each *S* and body-tilt condition. On each trial, *E* moved the sound source through the arc over *S*'s head toward the mid-position, until *S* indicated that this mid-position had been reached.[6] Correction for overshooting was permitted.

RESULTS

SETTING OF THE AUDITORY MIDLINE: CONSTANT ERRORS

Control vs. brain-injured Ss. The *F* tests are presented in Table 3. The pattern of results is the same for brain-injured and control *S*s, *i.e.*, there is an increasing tendency to displace the sound to the side opposite body tilt. This error increases more rapidly and to greater magnitudes among control *S*s, however. With judgments made from a 28°

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[6] In this respect, the procedure for obtaining judgments of the auditory midline differs from that followed in securing judgments of verticality of the luminous line. In spite of this difference, however, the auditory and visual tasks yielded parallel results.

tilt to the left, normal *S*s showed a progressive displacement with age, of the subjective auditory midline to 5.95° to the right. Conversely, there was a progressive displacement to 5.74° to the left with judgments made from a 28° tilt to the right. By contrast, the maximal displacement by the oldest brain-damaged *S*s (15–17 years) was only 2.63° to the right when they were tilted to the left, and 2.67° to the left when they were tilted to the right. Differences between control and brain-injured *S*s are minimal among the younger children (the first three age groups), where neither brain-damaged nor control *S*s displace the stimulus very much as a result of body tilt. These relationships between age, diagnosis, and side of tilt can be seen in Figure 1. The pattern of development, it would seem, is the same for both groups: the older the child (normal or brain-injured), the greater the constant error of localization, *i.e.*, the displacement to the side opposite body tilt. That error, however, increases much more steeply and reaches a greater magnitude among normal children.

Effect of type and severity of impairment. Calculated *t*-tests between the displacement scores of *S*s diagnosed as "spastic," "ataxic" or "athetoid" showed no differences between these neurologic groups. Similarly, *t*-tests between the displacement scores of *S*s with mild neurologic impairment and *S*s with severe impairment revealed no significant differences in any age group, nor for all age groups considered together. The number of hemiplegics in our sample was too small for any tests of the possibility that unilateral neurologic impairment might produce asymmetric effects on auditory localization.

The effect of intelligence. Within the brain-injured group, intelligence, as measured by the tests employed (Stanford-Binet or Columbia Maturity Scale), did not seem to affect the extent of displacement of the stimulus in setting the auditory midline during body tilt. There were no significant differences between *S*s with IQ's under 85 and those with IQ's over 85, within any age group, or for all age groups considered together.

TABLE 3

Summaries of Analyses of Variance:[7] *Midline Settings: Brain-Damaged vs. Normal*

Source	df	*Ss*	MS	F
Between *S*s	143	635.92		
Diagnosis (D)	1	3.90	3.90	<1
Sex (S)	1	1.58	1.58	<1
Age Group (G)	5	21.36	4.27	<1
D × S	1	6.08	6.08	1.27
D × G	5	8.97	1.79	<1
S × G	5	3.45	0.69	<1
D × S × G	5	16.77	3.35	<1
Error	120	573.81	4.78	
Within *S*s	144	3473.57		
Tilt (T)	1	1504.72	1504.72	5.86
T × D	1	256.70	256.70	12.14*
T × S	1	1.16	1.16	<1
T × G	5	515.97	103.19	4.88
T × D × S	1	7.58	7.58	<1
T × D × G	5	105.70	21.14	2.58*
T × S × G	5	11.86	2.37	<1
T × D × S × G	5	87.97	17.59	2.15
Error	120	981.91	8.18	
Total *S*s	287	4109.49		

STARTING-POSITION EFFECTS

Control vs. brain-injured Ss. F tests are presented in Table 4, and Table 5 shows the change in starting position with age for *S*s in both groups, brain-damaged and control. At every age level, normal *S*s show a smaller starting-position effect than do the brain-damaged children, and the overall significance is <.001. Unlike the setting of the auditory midline, differences between control and brain-damaged children exist even at the earliest age level tested, 5–7 years. Possibly, however, normal children younger than five might respond with as much start-

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[7] In tables 3 and 4, the asterisks after the F values indicate the level of significance attained for the corresponding source. One asterisk indicates a $p < .05$, two asterisks indicate a $p < .01$ and three asterisks indicate a $p < .001$.

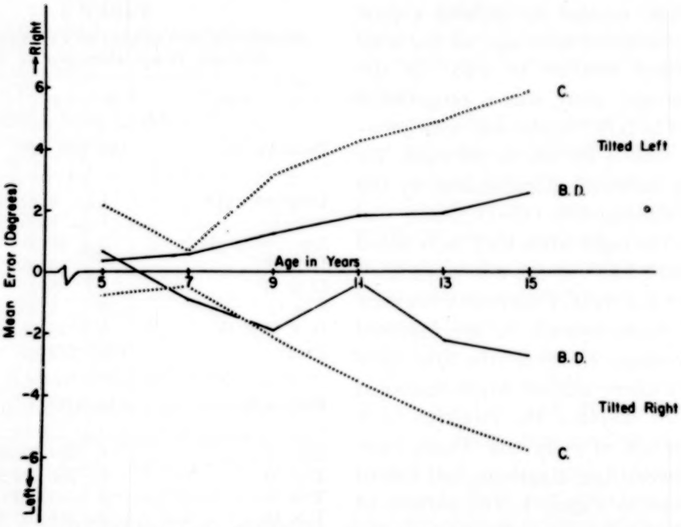

FIG. 1. Setting of the auditory midline: Constant errors according to age of *Ss*, their diagnosis, *i.e.* normal control (C), or Brain-damaged (B.D.), and side of tilt (left or right).

TABLE 4

Summary of Analysis of Variance:[7] *Starting-Position Effects: Brain-Damaged vs. Normal*

Source	df	*Ss*	MS	F
Diagnosis (D)	1	736.67	736.67	49.34***
Sex (S)	1	3.71	3.71	<1
Groups (G)	5	325.74	65.15	4.36**
D × S	1	9.55	9.55	<1
D × G	5	48.98	9.80	<1
S × G	5	136.94	27.39	<1.83
D × S × G	5	42.79	8.56	<1
Within	120	1791.67	14.93	
Total	143	3096.05		

TABLE 5

Average Starting-Position Effects in all Age Groups

Ages	5–7	7–9	9–11	11–13	13–15	15–17	Total
Brain-Damaged	13.92	12.74	12.07	12.64	13.53	8.83	73.73
Normals	9.99	9.47	7.26	7.68	6.81	5.39	46.60

ing-position effect as do our youngest brain-damaged *Ss*.

Effect of type and severity of impairment. None of the neurologic conditions (athetoid, spastic, or ataxic) had effects significantly different from any of the others in respect to starting position effect. Nevertheless, *t*-tests showed that *Ss* classified as severely impaired (see above) had significantly larger starting-position effects ($p < .005$), than those classified as mildly impaired, and these, in turn, had significantly larger starting-position effects ($p < .01$) than the normal controls (see Figure 2).

The effect of intelligence. The starting-position effect does not seem to be related to the intelligence of the brain-damaged *Ss*. Those with IQ's under 85 do not do significantly worse, or better, than those with IQ's over 85.

DISCUSSION

The principal outcome of this study is the difference between 1) the constant errors of setting a sound source to the midline and 2) the starting position effects obtained on the same task. The constant error is smallest in young (normal) children, normally grows with age, and is maximal in adults with injury to the anterior third of the brain. In children with early brain damage, the con-

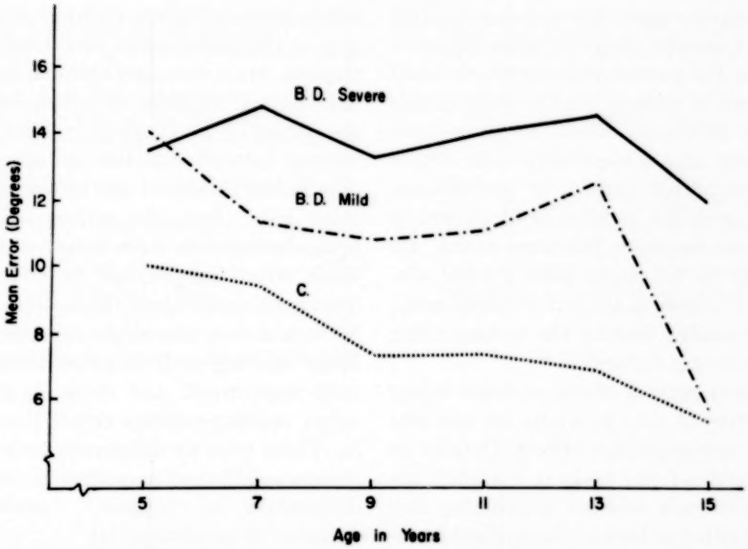

FIG. 2. Average starting-position errors as a function of age in normal controls (C) and in brain-damaged *S*s (B.D.) with mild and with severe neurologic impairment.

stant error is minimal at early ages, where it fails to discriminate between brain-damaged children and their normal controls, matched for age. Only as the brain-damaged children get older do divergent trends emerge: Their errors "stay" smaller than those of their contemporaries among the normal children. Thus, a task that reveals "specific" (or focal) effects of brain injury in the adult turns out to be unable to discriminate brain-damaged from normal children at early ages; the task becomes discriminating as it is applied to older children and adolescents.

A rather different picture emerges for the second effect investigated, the starting-position error. These starting-position effects are large in normal children and diminish with age. They are minimal in normal adults but are large, again, in adults after brain injury. In contrast to the constant errors of setting the vertical, however, large starting-position errors seem to reflect a general (nonlocalizable) effect of brain injury in adults: Penetrating injuries in any lobe, and in either or both of the cerebral hemispheres, have been found to produce exaggerated starting-position effects. It is precisely this nonspecific "sign" that appears to discriminate brain-damaged from normal children at early ages, and throughout the age range covered by this experiment. In fact, exaggerated starting-position effects were found to be maximal in those brain-damaged children who had severe neurologic symptoms, and significantly less in children with mild neurologic symptoms, and this difference held at all ages tested.

We can therefore suggest (at least for heuristic purposes) that results of certain perceptual tasks, in the brain-damaged child, might depend on whether the same task (or some analogous task) reveals specific or general effects of brain injury sustained in adulthood. Those indices that reveal general effects in adults (in the present experiment, the starting-position effects) will show qualitatively similar effects in brain-damaged children; these same indices may also be quantitatively more sensitive to the presence of early brain damage, and discriminate brain-damaged from normal children at earlier ages. By contrast, certain indices of specific effects of brain injury in adults (in the present experiment, the constant errors of setting) may be quite unable to reveal differential effects of brain damage at early ages. Conceivably, such indices reflect specialized aspects of performance that are acquired in later development, in analogy to language functions which are considered to be much more readily disturbed by lesions in the left cerebral hemisphere in adults, than by the corresponding lesions in young children.

Indices of general effects of brain injury (irrespective of site) in adults are not limited to starting-position effects. Deficits on certain hidden-figure tasks in the adult appear after brain injuries implicating any lobe, and either or both of the cerebral hemispheres (11). The same tasks are quite difficult for normal children (4, 14); if similar tasks of the same type are used, however, they turn out to present, again, disproportionate difficulties to the brain-damaged child (2, 3, 12). In some of the studies, it has been possible to show that the difficulty with hidden-figure tasks was maximal in brain-damaged children with severe neurologic symptoms, and less so in those with milder symptoms (2), and that test intelligence played little or no role. The results with hidden figures are thus analogous to those reported in the present study for starting-position effects.

SUMMARY

Seventy-two brain-damaged children, 5–17 years old, and carrying a neurological diagnosis of "cerebral palsy," were asked to set a sound source to the midline while their bodies were tilted. This procedure had previously been reported for 72 normal children (7). The pathologic group was matched with the normal group for age, the variable upon which the settings appeared to depend. Results were analyzed according to 1) constant errors, which depended on the posture of *S*, and 2) average starting-position errors, which depended on the position of the stimulus at the beginning of each trial. In both respects, brain-damaged children lagged behind normal children developmentally. In the setting of the auditory midline, the difference between the two groups emerged only in late childhood and increased. On the other hand, from the earliest age tested, brain-damaged *S*s made larger starting-position errors than normal *S*s, and this difference was maintained throughout. Further, *S*s with severe neurologic impairment had larger starting-position errors than *S*s with mild impairment, and these, in turn, had larger starting-position errors than normal *S*s. There were no differences between subgroups established according to neurologic designation as "spastic," "athetoid" or "ataxic," or in terms of IQ.

Results are compared with earlier observations (using analogous tasks) in normal and brain-injured adults. There, exaggerated constant errors of setting were found to be a "specific" symptom of penetrating lesions with entrance wounds in the anterior third of the brain. On the other hand, enhanced starting-position effects turned out to be a nonspecific symptom (found with brain injuries irrespective of site). The suggestion is made that certain indices of general (nonspecific) effects of brain injuries sustained in adulthood may reveal qualitatively similar effects in brain-damaged children. By contrast, several indices of specific (localizable) effects of brain injury in adults may fail to reveal any deficits in brain-damaged children until these children have reached a certain age.

REFERENCES

1. Aubert, H. Eine scheinbare bedeutende Drehung von Objekten bei Neigung des Kopfes nach rechts oder links. Virchow Arch. Path. Anat., **20:** 381–393, 1861.
2. Cobrinik, L. The performance of brain-injured children on hidden figure tasks. Amer. J. Psychol., **72:** 566–571, 1959.
3. Cruickshank, W. M., Bice, H. V. and Wallen, N. E. *Perception and Cerebral Palsy*. Syracuse Univ. Pr., Syracuse, N. Y., 1957.
4. Ghent, L. Perception of overlapping and em-

bedded figures by children of different ages. Amer. J. Psychol., **69:** 565–587, 1956.

5. Goldstein, K. *The Organism*. American Book Co., New York, 1939.
6. Lashley, K. S. *Brain Mechanisms and Intelligence*. Univ. Chicago Pr., Chicago, 1929.
7. Liebert, R. S. and Rudel, R. G. Auditory localization and adaptation to body tilt: A developmental study. Child Develop., **30:** 81–90, 1959.
8. Teuber, H.-L. Some alterations in behavior after cerebral lesions in man. In *Evolution of Nervous Control,* Chap. 8. Am. Assoc. Adv. Sc., Washington, D. C., 1959.
9. Teuber, H.-L. and Liebert, R. S. Specific and general effects of brain injury in man. A. M. A. Arch. Neurol. Psychiat., **80:** 403–407, 1958.
10. Teuber, H.-L. and Mishkin, M. Judgment of visual and postural vertical after brain injury. J. Psychol., **38:** 161–175, 1954.
11. Teuber, H.-L. and Weinstein, S. Ability to discover hidden figures after cerebral lesions. A. M. A. Arch. Neurol. Psychiat., **76:** 369–379, 1956.
12. Werner, H. and Strauss, A. A. Pathology of figure-ground relation in the child. J. Abnorm. Soc. Psychol., **36:** 236–248, 1941.
13. Werner, H. and Wapner, S. Experiments on sensory-tonic field theory of perception: IV. Effect of initial position of a rod on apparent verticality. J. Exp. Psychol., **43:** 68–74, 1952.
14. Witkin, H. A. Individual differences in ease of perception of embedded figures. J. Personality, **19:** 1–15, 1950.

THE BASAL GANGLIA IN PARKINSONISM[1]

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The application of the stereotaxic technique to the human brain (45) has permitted a study of the pathophysiology of the basal ganglia by means of depth electrography and by stimulation and the production of circumscribed lesions with a degree of accuracy previously attained in animal experiments only.

In view of the controversial statements of histopathologists regarding changes in the basal ganglia in Parkinsonism, it may be of interest to use *depth electrography* in order to ascertain the functional state of these ganglia in Parkinsonism. The absence of significant electrographic changes in the striatum in this disease has been noted by Meyers, Hayne and Knott (26). However, it has to be admitted that the loss of cell groups in a ganglion may not be reflected in the electrogram, and the possibility that striatal dysfunction may be associated with postural tremor cannot be completely denied in view of the finding of status cribrosus (perivascular foci, 15) in some cases with this type of tremor. We were interested in determining whether the electropallidogram shows a relationship to the tremor rhythm (39). The curves showed waves within or above the range of the alpha rhythm (11–16/sec). The rhythm of the electropallidogram appeared to be rather independent of the tremor rhythm shown in the electromyograms. Brazier *et al.* (6, 7) obtained occasional theta and delta waves from the pallidum, and alpha waves as well. However, her correlation analysis failed to detect a relationship of the pallidal rhythm to the tremor rhythm. This does not exclude the possibility that slow waves in the tremor rhythm, as observed by Snider (33), may occasionally occur; this, however, seems to be the exception rather than the rule.

In interpreting these findings, one has to bear in mind that, similarly to the EEG, the electrograms obtained with the usual macro-depth electrodes reflect dendritic potentials which are rather independent of the axonal discharges of the neurons (5, 14). The lack of a correlation between the electropallidograms and the tremor rhythm, therefore, can only be interpreted in the sense that the electropallidogram fails to supply findings in favor of a pallidal origin of the tremor. It does not permit one to exclude such a possibility with certainty.

Stimulation of the pallidum was performed in order to check the proper position of the electrode preceding the production of lesions so that encroachment upon the internal capsule would be avoided (40). We have available two groups of observations; one from a number of Parkinson patients, and the other from a group of epileptics who were refractory to standard medication and in whom depth electrography revealed seizure discharges in the pallidum—an attempt was therefore made to influence the seizures by interruption of centrifugal fibers of the pallidum. In these latter cases electrical stimulation of the pallidum did not produce motor phenomena. By contrast, in a number of patients with Parkinsonian tremor, an influence of pallidal stimulation upon their tremor could be observed. In some cases with tremor present during operation, an increase of its amplitude and/or its frequency could be noted. In others, in whom tremor was suppressed due to sedation or appeared only in bursts, pallidal stimulation was able to elicit a tremor on the opposite side; with stimulus frequencies above 10/sec, this tremor usually had a much slower rhythm than the stimulation. Frequently there was a latent period of several seconds between the beginning of the stimulus and the appearance of an effect upon the tremor; the effect outlasted the stimulus. The appearance of positive effects of pallidal stimulation regarding the production of, or an influence upon, the tremor depends on various factors; not only upon the strength of the stimulus, but also on the degree of sedation of the patient and the type of stimulating electrode used. If concentric needle electrodes are employed, so that only a rather small cell group can be stimulated, tremor is much more rarely elicited (in less than about one-third of the cases, also Walker's (53) experience) than if a larger cell group is being stimulated by employing a monopolar electrode, 1–2 mm. in length. In the latter case, one can reproduce or influence the tremor in about one-half of the cases. It must be emphasized that, if a larger electrode surface is employed, tremor can also be evoked without production of tonic or phasic effects on the extremities that would point to a spread of the current to the motor fibers of the internal capsule. An inhibitory effect of pallidal stimulation upon the tremor has been observed by the writers in only one single instance.

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An analogy to these experiences with patients may be found in animal experimentation. When tremor was produced by tegmental stimulation in cats, stimulation of the pallidum was able to increase the amplitude of this tremor (4). When subthreshold stimulation was applied to the midbrain, added pallidal stimulation, while by itself ineffective, induced tremor. In this connection, it is of interest that Adey and Buchwald (1) observed that an interaction between paired volleys to the pallidum and sciatic nerve is able to produce rhythmic discharges of cells of the reticular formation.

The electric activity of the cortex can be influenced by stimulation of the striatum as well as of the pallidum. Stimulation of the caudate nucleus has been chiefly performed in animals. Various effects were observed: inhibition (13), desynchronization (13, 32), recruitment (3, 21, 32, 50), or a change similar to the pattern of spontaneous onset of sleep (19). The differences of these effects seem to depend on a variety of factors. One such factor appears to be the stimulus frequency and the condition of the cortex preceding stimulation. In the experiments conducted by Gerebetzoff (13), for example, waves of high frequency and high amplitude were reduced in voltage only; if, however, slow waves in the cortex preceded the stimulation, an acceleration was obtained. With slow frequencies of stimulation, recruitment phenomena were recorded; with higher frequencies, chiefly desynchronization. The complexity of the corticopetal pathways set into activity by a single stimulus to the head of the caudate nucleus was demonstrated by Purpura *et al.* (28).

Stimulation of the pallidum performed in patients preceding pallidoansotomy was able to induce recruitment phenomena, waxing and waning of the cortical discharges (16, 40, 41, 51).

Since most of our stimulations were carried out in awake patients operated upon under local anaesthesia, we could only occasionally study the arousal effect of pallidal stimulation described by the Freiburg group. In patients with dyskinesias who were operated upon under general anaesthesia, the depth of the anaesthesia may have sometimes prevented the appearance of a definite arousal reaction.

In carnivores and primates an inability of the organism to relate itself to the environment, a "lethargic stubborness," and an impairment of retention have been observed by Mettler (24) after removal of the striatum. Similar large striatal lesions in the human apparently have not been produced. However, transient drowsiness may be observed after unilateral pallidal lesions (20). To what extent such an effect is due to loss of pallidofugal impulses and to what extent to impairment of adjacent structures, *e.g.* of the thalamus by edema, is difficult to ascertain. In any case, Ajmone-Marsan and Dilworth (3) found cortical recruiting responses only slightly affected after lesions of the caudate nuclei, and Szekely (49) found these reactions well-preserved in cats after bilateral elimination of the pallidum. The striopallidum, accordingly, is dispensable in the mechanism of the cortical recruiting responses on thalamic stimulation.

The effect of pallidal lesions upon the Parkinsonian tremor can best be studied by recording electromyograms. In some instances tremor may have disappeared as far as simple observation or photoelectric recording permit one to ascertain. Yet electromyograms may still reveal small rhythmic discharges in the tremor rhythm, sometimes only in one muscle group, while they may be absent in the antagonists (39).

As for the rigor in paralysis agitans and Parkinsonism, opinion was prevalent in the older literature that this rigor was due to a lesion of the pallidum, and Förster (12) in Germany coined the term "pallidum rigor." This opinion was based on clinico-pathologic observations in diseases diffusely affecting various parts of the basal ganglia and of the brain stem (not only the pallidum but also the substantia nigra and other parts of the brain stem). Circumscribed pallidal lesions produced by stereotaxic pallidotomy (first performed by Spiegel and Wycis (37) in Huntington's chorea in 1948) have shown that Förster's concept of a pallidal rigor is untenable, and that such lesions in Parkinsonism are able to reduce or abolish not only the tremor but also the rigidity. This could also be demonstrated objectively (42) by use of a myotonometer that records torque as a function of angular displacement. Recently, Webster (54) also demonstrated the decrease of the rigidity by means of an apparatus that records rotational torque. Even severe contractures could be relieved by pallidal lesions. The observation that lesions limited to the pallidum do not produce rigidity are in agreement with Mettler's (24) observation in monkeys, and a tonus-decreasing effect of pallidal lesions in Parkinsonism is now generally accepted (*e.g.*, 8, 27, 30). However, it does not seem quite clear why rigidity increases when the pallidum is eliminated in addition to structures lying above it (24). The decrease of the rigor is, of course, able to improve the patient's ability to perform voluntary movements.

Regarding the influence of pallidal lesions upon associated movements, it is known from Mettler's experiments in monkeys that bilateral destruction of the pallidum may induce a loss of these movements. In man, incomplete circumscribed pallidal lesions are usually produced by pallido-ansotomy; such lesions do not abolish the associated movements, as is shown by observations in epileptics. In Parkinson patients such circumscribed pallidal lesions, by reducing the rigidity, may to a certain extent induce an improvement in the performance of associated movements, insofar as their impairment is caused by the rigidity.

For an interpretation of the role of the pallidum in the mechanism of the resting tremor, it is important to note not only that the electropallidogram usually fails to show a correlation with the tremor rhythm, but also that in some cases of severe generalized tremor extensive pallidal lesions may be ineffective. Furthermore, a tremor abolished or greatly reduced by pallidoansotomy may reappear or at least become demonstrable in the electromyogram. These observations, together with the experience that stimulation of the mesencephalic tegmentum in cats may elicit a tremor several weeks after ablation of the motor cortex and the frontal lobe and destruction of the pallidum (47), induce us to assume that the circuits responsible for the genesis of the tremor are to be sought in levels below the pallidum. Since the resting tremor is a pathologic distortion of the normal static innervation, it may be suspected that the circuits which maintain the static innervation are also responsible for the production of the resting tremor. With respect to the static innervation, Spiegel and Bernis (34) have shown as early as **1925** (*i.e.*, over **20** years preceding Magoun's (**22**) work on this subject), that it is maintained by reflex arcs centered in the reticular formation of the rhombencephalon, besides the spinal cord reflexes. Up to the present time, electrographic studies in Parkinson patients could be carried out only in the oral part of the mesencephalon in the area dorsal to the nucleus ruber (46). Only occasionally they revealed slow waves in the tremor rhythm that could not be considered as movement artifacts. The validity of the hypothesis that the resting tremor originates in spinal and/or rhombencephalic reticular circuits will have to be tested by electrographic studies of these areas in Parkinson patients, if and when an occasion to record from these areas should arise.

Since the observations outlined above suggest that the resting tremor originates in the spinal cord and/or the rhombencephalon, the depression or abolition of the tremor following pallidal lesions has to be explained by the loss of tonic, activating impulses to these tremorogenic areas. Similarly, the decrease of rigidity following lesions of the pallidum or of its efferent fibers may be explained by the loss of pallidofugal activating impulses to the rhombencephalic centers of the static innervation.

Two questions arise. 1) In which way do pallidofugal impulses influence the tremor and tonus mechanisms, and 2) where do the impulses originate that may modify the pallidal activity? Regarding the first, the conduction of impulses to the nucleus ventralis lateralis and nucleus ventralis anterior, and from these nuclei to the cerebral cortex, may be at least partly of importance. The existence of such impulses is suggested by the observation of arousal and recruitment phenomena following pallidal stimulation and of transitory drowsiness after pallidal lesions. Hassler (15, 16) believes that the effect of pallidotomy, regarding tremor and rigor, is caused by the elimination of such impulses conducted by way of these thalamic nuclei to cortical areas where the so-called pyramidal and extrapyramidal tracts originate. On stimulation of the nucleus ventralis lateralis, a latent tremor may reappear and the frequency of an existing tremor may be changed (2, 18). Following lesions in the region of the nucleus ventralis lateralis, reduction or abolition of Parkinsonian tremor has been observed by the writers and by other investigators (9, 17). The participation of the mechanism suggested by Hassler should not be denied; however, it should be pointed out that the tremor induced by tegmental stimulation may be augmented by pallidal stimulation even following degeneration of the internal capsule (4). In recent experiments of Dr. Spuler and Dr. Szekely in the writer's laboratory (47), it was also found that ablation of the frontal lobe and motor area, with subsequent degeneration of the internal capsule, does not prevent an effect of stimulation of the nucleus ventralis lateralis upon tegmental tremor. Furthermore, resting tremor has been observed despite degeneration of the pyramidal tract (10) and of the cerebral peduncle (25) and can be decreased or abolished by tegmental lesions distant from the cerebral peduncle (46). Thus it would seem that, besides impulses ascending from the pallidum by way of thalamic nuclei to cortical areas where pyramidal fibers originate, impulses descending to lower parts of the brain stem are also of importance.

Hassler (20) distinguishes in the area of the nucleus ventralis lateralis a nucleus ventralis oralis (n.v.o.) anterior and posterior. While the n.v.o. anterior transmits pallidal impulses to the area 6aα, cerebellar impulses are supposed to synapse in the n.v.o. posterior that projects to area 4 γ. Elimination of the latter nucleus is said to be particularly effective in reducing or abolishing the Parkinson tremor (17). Thus it would seem that the interruption of afferent impulses which the motor cortex receives from the cerebellum is able to reduce the Parkinson tremor. It is, however, difficult to reconcile this view with the experience of Delmas-Marsalet and van Bogaert (11) that a cerebellar lesion affecting the dentate nucleus increased the Parkinsonian tremor. Obviously a definite statement regarding the role of the nucleus ventralis oralis anterior and posterior will be possible only if and when cases with histologically studied lesions of this area will be available. It may then be possible to ascertain whether lesions of these nuclei are able to reduce tremor and/or rigidity without affecting closely adjacent fibers that carry pallidofugal impulses to lower segments of the central nervous system.

Regarding the impulses that may modify the pallidal activity, three sources have to be considered: the frontal lobe, the striatum and the thalamus. It is generally assumed that the striatum inhibits the pallidum (*e.g.*, 23, 24). However, such a general statement seems hardly justifiable. On the one hand, on chronic stimulation of the head of the caudate nucleus by injection of alumina cream in cats, the amplitude of the electropallidogram is increased (35, 43). On the other hand, immediately following large lesions of the head of the caudate nucleus, one may find the electrical activity of the pallidum practically unchanged or the amplitude of the electropallidogram decreased (43). Only occasionally one may find transient spike discharges that are apparently due to the stimulating effect of the traumatic injury. However, several weeks after the striatal lesions the amplitude of the pallidal discharges increases. This seems to indicate that pallidal hyperactivity following striatal lesions is not due to release from striatal inhibition, but should be interpreted as an isolation phenomenon that develops gradually after such lesions.

Multiple impulses from various parts of the thalamus, from the nuclei of the so-called nonspecific projection system (intralaminar nuclei, ventralis anterior, centrum medianum) as well as from association nuclei, and to a certain extent also from the nucleus ventralis posterior, may influence the functional state of the caudate nucleus as well as of the pallidum (36). Thalamic stimulation with single electric impulses elicits single or multiple waves and spindle formations; with repeated stimulation, particularly of the nuclei of the nonspecific systems (4–10/sec), recruitment phenomena were described by Starzl and Magoun (48) and by Ajmone-Marsan and Dilworth (3) for the caudate nucleus. However, these reactions are not limited to the caudate but can also be recorded from the pallidum; the pallidal reactions may appear either simultaneously with those in the striatum or independently, and large lesions of the head of the caudate nucleus do not prevent such responses (36). Such a thalamic influence upon the pallidum could be observed by us not only in the cat but also in man; on stimulation in the region of the lamina medullaris interna recruitment phenomena appeared in the pallidum.

These experiences indicate that the functional state of the pallidum is closely related to that of the thalamus. It may be inferred that sensory and emotional stimuli, by increasing the state of excitation of the thalamus, are able to augment pallidofugal impulses that act upon tremorogenic areas. This may explain, at least partially, that emotions increase the tremor. Conversely, if the thalamus is quiescent as in states of decreased consciousness, the pallidofugal impulses to the tremorogenic areas will also be reduced, and the tremor will stop[3]. The tonus increasing pallidofugal impulses may also be activated by a thalamopallidal circuit, as suggested by Mettler (24). In agreement with this concept, Webster (54) found that the rigidity drops to normal in sleep. This circuit apparently receives afferent impulses from the posterior columns, since reduction of rigidity by sectioning of these columns has been reported (**29**, **31**). However, this is in contrast to the experience that decerebrate rigidity is hardly influenced by cutting the posterior columns.

SUMMARY

The electropallidogram recorded in Parkinson patients usually shows a rhythm that is independent of the tremor rhythm revealed in the electromyogram.

The effects on tremor observed in Parkinson patients, on stimulation of the pallidum and on tremor and rigidity noted after production of circumscribed lesions in this ganglion, suggest that the pallidum sends continuous facilitating or activating impulses to those rhombencephalic and spinal mechanisms which maintain the static innervation and its pathologic distortions, the resting tremor and muscular hypertension. This conclusion is supported by animal experiments in which pallidal stimulation augmented a tremor induced by stimulation of the mesencephalic or pontine tegmentum. The elimination of these pallidofugal impulses depresses the activity of the tremor and tonus-maintaining mechanisms.

Corticopetal fibers transmitting pallidofugal impulses by way of the nucleus ventralis lateralis and anterior to the motor and premotor areas and continued by corticofugal systems entering the internal capsule and pyramidal tract, carry only part of the pallidofugal impulses that enhance tremor and muscle tonus. The importance of impulses descending to the rhombencephalon without using a cortical circuit should not be underestimated.

The state of excitation of the pallidum depends to a large extent on impulses it receives from thalamic nuclei.

Chronic stimulation of the caudate nucleus of cats obtained by injection of alumina cream as well as production of lesions in the head of the caudate nucleus (Spiegel and Szekely) suggest that the view of an inhibitory effect of the striatum upon the pallidum has to be revised. Increased pallidal activity following striatal lesions has to be regarded as an isolation phenomenon rather than as due to release of the pallidum from striatal inhibition.

REFERENCES

1. Adey, W. R. and Buchwald, N. A. Amygdaloid and pallidal influences on midbrain reticular units responding to sciatic nerve stimulation. Physiologist, **1**: No. 4, p. 1, 1958.
2. Adey, W. R., Rand, R. W. and Walter, R. D. Depth stimulation and recording in thalamus and globus pallidus of patients with paralysis agitans. J. Nerv. Ment. Dis., **129**: 417–428, 1959.
3. Ajmone Marsan, C. and Dilworth, M. Nonspecific projection system of the thalamus and striate system. Electroencephal. Clin. Neurophysiol., Suppl. 3, p. 85, 1953.
4. Alexander, G. L., Szekely, E. G. and Spiegel, E. A. Effect of stimulation of the pallidum on experimental tegmental tremor in the cat. J. Neuropath. Exp. Neurol., **19**: 116–124, 1960.
5. Bishop, G. H. Natural history of the nerve impulse. Physiol. Rev., **36**: 376, 1956.
6. Brazier, M. A. B. and Barlow, J. S. Correlation analysis of depth recordings from the basal ganglia. Electroencephal. Clin. Neurophysiol., **9**: 171, 1957.
7. Brazier, M. A. B., Kjellberg, R. N., Sweet, W. H. and Barlow, J. S. Depth recordings with correlation analysis from the basal ganglia in the unanesthetized human brain. Proc. Symp. Electric Studies on Unanesthetized Brain, held at Georgetown Univ., June, 1957. In press.
8. Cooper, I. S. *The Neurosurgical Alleviation of*

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[3] This does not exclude the participation of other mechanisms, *e.g.*, that sensory impulses may increase the tremor by way of reflex collaterals from the ascending pathways in the tegmentum, acting upon cells of the reticular formation; or that descending impulses from the rhinencephalon, particularly from the amygdala (Adey), may influence the reticular cells.

Parkinsonism. Thomas, Springfield, Ill., 1956.

9. Cooper, I. S. and Bravo, G. J. Chemopallidectomy and chemothalamectomy. J. Neurosurg., **15:** 244–250, 1958.
10. Davison, C. The role of the globus pallidus and substantia nigra in the production of rigidity and tremor. Res. Publ. Ass. Nerv. Ment. Dis., **21:** 267–333, 1942.
11. Delmas-Marsalet, P. and van Bogaert, L. Sur un cas de myoclonies rhythmiques continuées par une intervention chirurgicale sur le trone cérébral. Rev. Neurol., **64:** 728–740, 1935.
12. Foerster, O. Zur Analyse and Pathophysiologie der striären Bewegungsstörungen. Z. ges. Neurol. Psychiat., **73:** 1–169, 1921.
13. Gerebetzoff, M. A. Contribution à la physiologie du corps strié. Arch. Int. Physiol., **51:** 333–352, 1941.
14. Grundfest, H. Electrophysiology and pharmacology of dendrites. Electroencephal. Clin. Neurophysiol., Suppl. 10, pp. 22–41, 1958.
15. Hassler, R. Extrapyramidal-motorische Syndrome und Erkrankungen. In *Handbuch der inneren Medizin*, Vol. 5, pt. 3, pp. 676–904, 1953.
16. Hassler, R. Functional anatomy of the thalamus. In Proc. 6th Congr. Latinoamer. Neurocir., Montevideo, Uruguay, 1955, pp. 754–787.
17. Hassler, R. and Riechert, T. Symptomatik und operative Behandlung der extrapyramidalen Bewegungsstörungen. Med. Klin., **53:** 817–824, 1958.
18. Hassler, R., Riechert, T. and Mundinger, F. Quoted by Jung and Hassler in reference no. 20.
19. Hess, R., Koella, W. P. and Akert, K. EEG of natural and artificial sleep in cats. Electroenceph. Clin. Neurophysiol., **5:** 75–90, 1953.
20. Jung, R. and Hassler, R. The extrapyramidal motor system. In *Handbook of Physiology*, Sect. 1, pt. 2, pp. 863–927. Amer. Physiol. Soc., Washington, D. C., 1960.
21. Jung, R. and Toennies, J. F. Hirnelektrische Untersuchungen über Entstehung und Erhaltung von Krampfentladungen: Die Vorgänge am Reizort und die Bremsfähigkeit des Gehirns. Arch. für Psychiatrie, **185:** 701–735, 1950.
22. Magoun, H. W. and Rhines, R. *Spasticity, the Stretchreflex and Extrapyramidal System*. Thomas, Springfield, Ill., 1948.
23. Martin, J. P. Remarks on the function of the basal ganglia. Lancet, **2:** 999–1005, 1959.
24. Mettler, F. A. Anatomy and physiology of the extrapyramidal motor passage. In Ier Congr. Int. Sci. Neurol., Rapports et Discussions, Vol. 1, pp. 11–37. Editions Acta Med. Belgica, Brussels, 1957.
25. Mettler, F. A., Davidoff, L. M. and Grimes, R. Static tremor with hemiplegia. Arch. Neurol. Psychiat., **57:** 423–429, 1947.
26. Meyers, R., Hayne, R. and Knott, J. Electrical activity of the neostriatum, paleostriatum, and neighboring structures in Parkinsonism and hemiballismus. J. Neurol. Neurosurg. Psychiat., **12:** 111–123, 1949.
27. Narabayashi, H. and Okuma, T. Procaine oi blocking of the globus pallidus for the treatment of rigidity and tremor of Parkinsonism Proc. Japan. Acad., **29:** 134–137, 1953.
28. Purpura, D. P., Housepian, E. M. and Grundfest, H. Analysis of caudate-cortical connection. Arch. Ital. Biol., **96:** 145–167, 1958.
29. Puusepp, L. M. Cordotomia posterior lateralis (fasc. Burdachi). Folia Neuropath. Eston., **10:** 62–66, 1930.
30. Riechert, T. Stereotaktische Operationen bei Bewegungsstörungen. D. Z. Nervenheilk., **175:** 511–519, 1957.
31. Rizatti, E. and Moreno, G. Cordotomia laterale posteriore nella cura della ipertonie extrapiramidali postencephalitiche. Schizofrenie, **5:** 117–122, 1936.
32. Shimamoto, T. and Verzeano, M. Relations between caudate and diffusely projecting thalamic nuclei. J. Neurophysiol., **17:** 278–287, 1954.
33. Snider, R. S. and Wetzel, N. Neurophysiological correlates in human stereotaxis. In *Symposium on Basal Ganglia Surgery*. New York University, 1958.
34. Spiegel, E. A. and Bernis, W. J. Zentren der statischen Innervation. Arb. Neurol. Inst. Univ. Wien, **27:** 197–224, 1925.
35. Spiegel, E. A. and Szekely, E. G. Catatonia induced by chronic stimulation of striatum. Fed. Proc., **17:** No. 1, 1958.
36. Spiegel, E. A., Szekely, E. G. and Baker, W. W. Electrographic study of thalamic impulses to the striatum and pallidum. Electroenceph. Clin. Neurophysiol., **9:** 291–299, 1957.
37. Spiegel, E. A. and Wycis, H. T. Pallido-thalamotomy in choera. Arch. Neurol. Psychiat., **64:** 295–296, 1950.
38. Spiegel, E. A. and Wycis, H. T. *Stereoencephalotomy, Part I. Methods and Stereotaxic Atlas of the Human Brain*. Grune & Stratton, New York, 1952.
39. Spiegel, E. A. and Wycis, H. T. Ansotomy in paralysis agitans. A. M. A. Arch. Neurol. Psychiat., **71:** 598–614, 1954.
40. Spiegel, E. A. and Wycis, H. T. Stimulation of brain stem and basal ganglia in man. In *Symposium on Brain Stimulation*. Univ. of Houston and Hogg Foundation. April, 1956.
41. Spiegel, E. A., Wycis, H. T. and Baird, H. W. Interrelationships between cortex and subcortical structures. 3rd Intl. EEG Congress, Boston 1953. Electroenceph. Clin. Neurophysiol., Suppl. 4, pp. 192–196, 1954.
42. Spiegel, E. A., Wycis, H. T., Baird, H. W., Rovner, D. and Thur, C. Pallidum and muscle tone. Neurology, **6:** 350–356, 1956.
43. Spiegel, E. A., Wycis, H. T., Baird, H. W. and Szekely, E. G. Physiopathologic observations on the basal ganglia. In Ier Congr. Int. Sci.

Neurol., Rapports et Discussions, Vol. 5, pp. 118–122. Editions Acta Med. Belgica, Brussels, 1957.

44. Spiegel, E. A., Wycis, H. T., Baird, H. W. and Szekely, E. G. Functional state of basal ganglia in extrapyramidal and convulsive disorders. A. M. A. Arch. Neurol. Psychiat., **75:** 167–174, 1956.

45. Spiegel, E. A., Wycis, H. T., Marks, M. and Lee, A. J. Stereotaxic apparatus for operations on human brain. Science, **106:** 349, 1947.

46. Spiegel, E. A., Wycis, H. T., Szekely, E. G., Rusy, B. and Baird, H. W. Study of the mesencephalic tegmentum in paralysis agitans and Parkinsonism. A. M. A. Arch. Neurol., **2:** 46–54, 1960.

47. Spuler, H., Szekely, E. G. and Spiegel, E. A. In press.

48. Starzl, T. E. and Magoun, H. W. Organization of the diffuse thalamic projection system. J. Neurophysiol., **14:** 133–146, 1951.

49. Szekely, E. G. Cortical recruiting on thalamic stimulation after elimination of the pallidum. Confin. Neurol., **17:** 243–249, 1957.

50. Terzuolo, C. and Stoupel, N. Données nouvelles sur les connections et la physiologie du noyau caudé. Bruxelles Med., **33:** 411–412, 1953.

51. Umbach, W. Tiefen u. Cortexableitungen während stereotaktischer Operationen am Menschen. In Ier Cong. Int. Neurochir., Rapports et Discussions, pp. 161–170. Brussels, 1957.

52. Verzeano, M. and Shimamoto, T. Relations between the caudate nucleus and the diffuse thalamic projection system. Electroenceph. Clin. Neurophysiol., Suppl. 3, p. 86, 1953.

53. Walker, A. E. Physiological principles and results of neurosurgical interventions in extrapyramidal diseases. In Ier Cong. Int. Sci. Neurol., Rapports et Discussions, Vol. 1, pp. 118–137. Editions Acta Med. Belgica, Brussels, 1957.

54. Webster, D. D. Dynamic measurement of rigidity, strength and tremor in Parkinson patients. Neurology, **10:** 157–163, 1960.

55. Wycis, H. T. and Spiegel, E. A. Ansotomy in paralysis agitans. Confin. Neurol., **12:** 245–246, 1952.

THE PSYCHOPATHIC OR ANTISOCIAL PERSONALITY

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PART ONE

WHAT IS A PSYCHOPATH?

The Psychiatric Glossary published by the Committee on Public Information of the American Psychiatric Association defines a psychopath as follows:

> "A person whose behavior is predominantly amoral or anti-social and characterized by impulsive, irresponsible actions satisfying only immediate and narcissistic interests without concern for obvious and implicit social consequences, accompanied by minimal outward evidence of anxiety or guilt. Increasingly considered a poor and inexact term."

Despite this unfavorable comment it is the belief of the writer that the term will survive. It has the important virtue that, as a result of long usage and much observation and argument it is now a realistically descriptive term based on experience, rather than a theoretical term based on a deduction from preconceived premises.

Sidney Maughs traced the slow evolution of the concept of moral insanity to that of psychopathic personality through two centuries of time and the attacks occasioned by its being successively regarded as a challenge to two deeply-held faiths. Historically the first challenge was that felt by some exponents of traditional religious faith that the concept was a threat to the doctrine of moral responsibility. This protest was expressed in the words of John Ordronaux, Professor of Medical Jurisprudence at Columbia University, "The only disease to which the moral nature is subject is sin."

Effective challenge to a basic faith always causes pain and a reaction ridden with emotion in which the issues can easily become clouded. This has been true also in the second challenge to a faith involved in the evolution of the concept psychopathic personality. This challenge has been felt by some of the defenders of the modern psychodynamic faith which, at least initially, tended to a narrow conception that functional mental disorders and maladjustments are always due to conflicts within the personality. To enlarge this concept with a realization that morbid conditions and gross maladjustment may be due primarily to a *lack* of conflict within the personality represents a readjustment of thinking which is apparently beyond the flexibility of many professional persons. There is of course a semantic problem involved. It was not difficult for mankind to understand poisoning, for it is easy to grasp the proposition, "What he ate made him sick." The understanding of the vitamin deficiency diseases was more difficult because of the greater semantic difficulty of the proposition, "What he did not eat made him sick." (4). Yet this second proposition is as true and as necessary to any adequate consideration of illness as is the first. In the same way many of our dynamically oriented colleagues have great difficulty with the proposition, "The conflict he does not have makes him a psychopath." This concept is true and necessary, but requires at least a flexible application of classical psychodynamic theory.

Theories are advantageous when they stimulate some resourceful new attack on a problem. They are handicapping when they make it difficult for us to recognize important facts. Since we will undoubtedly have the problem of the psychopath with us long after our theories have been modified, it is worthwhile to take a careful look at these facts. Unfortunately they are not readily available to most psychiatrists in private office practice, because the well-developed psychopath does not feel a need for psychiatric treatment, nor does he seek it unless with tongue in cheek as an alternative to receiving punishment. But psychopaths may be observed in the court clinic or in the correctional institution by the professional who wishes to study them.

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The long shakedown in the concept and definition of the psychopathic personality has resulted, to my judgment, in a far clearer conception than the more theoretically based and confused concepts such as "character neurosis." If indeed we must get into the area of theory—and this is not entirely avoidable—I should like to propose that psychopaths differ from psychoneurotics and indeed contrast with them in their most important characteristics. The typical psychopath and the typical psychoneurotic are, in some important regards, on opposite sides of the normal. Where the psychoneurotic suffers from excessive inner conflict, the psychopath makes others suffer from his lack of inner conflict. Only the person who does not come in contact with serious cases of this sort, or whose mind is literally imprisoned by his faith in a theory can brush aside this fundamental difference. Whether we retain the name or not, the concept of the psychopathic personality will remain with us, for it is founded in experience, and we need it.

It is of interest that the Diagnostic and Statistical Manual of Mental Disorders, American Psychiatric Association, has deleted the term "psychopath." The writer is inclined to believe this deletion may have been the result of the tendency to use the term as a judgmental rather than a diagnostic expression. Dr. Leo Kanner satirized this practice when he offered the definition: "A psychopath is somebody you don't like." Often this simple definition seems to be distressingly accurate.

Clearly the psychopathic personality would fall among the personality disorders. The personality disorders are the step-children of psychiatry. Neither the public nor most of our profession can quite decide whether or to what extent they are our responsibility. The history of their classification is a history of reluctant fumbling toward working definitions. Just as the layman has been reluctant to assign responsibility for the psychopath to the psychiatric profession, the psychiatric profession has been very reluctant to assume any responsibility for the true psychopath. And such unpopularity is not undeserved.

It is natural that the diagnostic classification of the personality disorders is not very satisfactory, for it is reached in large part by exclusion. A diagnosis of personality reaction is reached not by a qualitative difference from the normal, as in the incoherence or delusions of the schizophrenic, but only by a quantitative difference. The only thing the various personality disorders have in common aside from difficulty in adjusting is that they do not characteristically show qualitatively abnormal symptoms. Every case involving a serious and persistent problem of adjustment not classifiable as a brain syndrome, a psychosis, or a psychoneurotic or psychophysiological reaction, is relegated to the broad basket of personality disorders. As a consequence the layman, who easily recognizes the mental illness of the severe schizophrenic, is typically but little inclined to regard the individual with a personality disorder as having an illness, particularly if he commits a crime, and may look askance at our using any psychiatric label at all. And we must admit that by present definitions the group of personality disorders represents at best a miscellany and at worst a convenient waste paper basket. The group is subdivided into personality pattern disturbances, personality trait disturbances and sociopathic personality disturbances.

The personality pattern disturbances includes one category, *inadequate personality*, which relates itself behaviorally to mental deficiency, and three categories which relate themselves personality-wise to psychoses—

schizoid personality, cyclothymic personality, and *paranoid personality.*

The personality trait disturbances include one group, *compulsive personality,* which relates to a makeup which predisposes to psychoneurotic breakdown and two others, *emotionally unstable personality* and *passive aggressive personality,* which relate to poor control or poor socialization.

In our search for the criminal psychopath in our classification system, we approach the mark when we come to sociopathic personality disturbance. But here we have four subcategories. There are the addictions, which whatever the predisposing factors, are certainly to be recognized as a form of poisoning and drug dependence. It is of interest that while the classification recognizes in the case of drug addiction that a double diagnosis is proper, *i.e., emotionally unstable personality* and *addiction to morphine,* the definition of addiction to alcohol states, "Included in this category will be cases in which there is well-established addiction to alcohol *without recognizable underlying disorder*" (Italics added). Thus, the Manual clearly indicates that *addiction to alcohol* should not be diagnosed in the presence of a personality disorder such as *emotionally unstable personality.* The clear implication is that having an emotionally unstable personality protects one from becoming an alcoholic.

The reason behind this rather fascinating implication is doubtless a sincere but awkwardly artificial attempt to correct for human intolerances. Some people drink to excess for the purpose of relieving anxiety which is an expression of some psychiatric disorder, most often an *anxiety reaction.* If one looks only to the drinking, without considering whether or not some such psychiatric disorder underlies it, it is easy—often too easy—to ascribe the person's whole problem to drink, or to his natural depravity or, to use the military expression, to his wilful misconduct. This often results in clearly recognizable injustices. It would appear that this limitation in definition is included for moral rather than for scientific reasons. Without entering into the question of the validity of the moral reasons, I do not think we can be well satisfied with having them determine the answers to presumably scientific questions.

In Appendix 3 of the Manual, the term *sexual deviation* in the 4th and 5th editions is equated with *psychopathic personality with pathologic sexuality* in the 3rd edition. Sexual deviation relates to deviation from socially approved sexual behavior and/or from socially accepted sexual desires—deviation in what an individual chooses to erotize or to romanticize. There is no invariable relationship between such deviations and the normality of sexual impulse so far as its biological function of reproduction is concerned, nor is there any necessary relation between such deviations and the individual's capacity to fulfill a constructive role in the community. I prefer not to become involved in this area except to state that specifying that an individual is a sexual deviate does not specify that he is a psychopath in any reasonable usage of the term, even though some psychopaths are also sexual deviates.

The two remaining categories of sociopathic personality, *antisocial reaction* and *dyssocial reaction,* commonly relate to criminal behavior. *Antisocial reaction* is listed as the new equivalent of psychopathic personality. *Dyssocial reaction* is equated to psychopathic personality with asocial and amoral trends.

The diagnosis *antisocial reaction* is characterized as follows in the Manual:

> "This term refers to chronically antisocial individuals who are always in trouble, profiting neither from experience nor punishment, and maintaining no real loyalties to any person, group, or code. They are frequently callous and hedonistic, showing marked emotional immaturity, with lack of sense of responsibility, lack of judgment, and an ability to rationalize their behavior so that it appears warranted, reasonable, and justified.

> "The term includes cases previously classified as 'constitutional psychopathic state' and 'psychopathic personality.' As defined here the term is more limited, as well as more specific in its application."

This is a description of the classical psychopath. It contrasts with the next diagnosis, *dyssocial reaction,* which is described as follows:

> "This term applies to individuals who manifest disregard for the usual social codes, and often come in conflict with them, as the result of having lived all their lives in an abnormal moral environment. They may be capable of strong loyalties. These individuals typically do not show significant personality deviations other than those implied by adherence to the values or code of their own predatory, criminal, or other social group. The term includes such diagnoses as 'pseudosocial personality' and 'psychopathic personality with asocial and amoral trends.'"

It is my contention that the *dyssocial reaction,* which describes the professional criminal, must be distinguished from the psychopathic personality. Indeed they have nothing in common except that they both have trouble with the law. The person showing an *antisocial reaction* in pronounced form is a true classical psychopath. The person showing a *dyssocial reaction* in pronounced form is typically a professional criminal. This is an occupational group, rather than a psychiatric diagnosis, an occupational group in which the competition is keen and a code of behavior is often surprisingly strong, and this occupational group sharply contrasts with the psychopath in observing a code. Indeed, when it recognizes a psychopath within its ranks this group is likely to eliminate him ruthlessly.

The contrast between the psychopath and the professional criminal is far greater than the contrast between the professional criminal and the law-abiding citizen. Both of the latter normally pursue occupational goals, one legal, the other illegal. Both are in part motivated by the desire for financial gain, either as a means or as an end in itself. Both learn by experience. Both plan their behavior and modify and adapt it according to the circumstances which they meet. Both understand each other far better than either can understand the psychopath.

The members of these two groups, the antisocial and the dyssocial, typically have different antecedents. The professional criminal is a cultural product—typically a natively tough and venturesome youngster who has grown up in deprived circumstances, who has lacked paternal guidance (or exceptionally who has been guided by a criminal father), who has been exposed to similar venturesome and to some degree delinquent companions and to the learning of delinquent techniques to get what he wants.

These groups are clearly differentiable "in embryo," so to speak, in the child guidance clinic. A study of the writer with Sylvia Glickman (9) of Luton Ackerson's published material on 5,000 child guidance clinic cases revealed that the strongest cluster of intercorrelated traits among a group of over 2,000 boys six to seventeen years of age and among a group of over 1,000 girls is that indicated in Table 1.

TABLE 1
Syndrome of Socialized Delinquency

Six Central Traits of Cluster	Mean Intercorrelations with Cluster Traits	Percentage of Cases Showing Trait
Boys		
Stealing	.53	26
Truancy from home	.51	16
Truancy from school	.48	21
Police arrest	.48	17
Staying out late at night	.44	12
Associating with bad companions	.42	06
Girls		
Staying out late nights	.47	09
Truancy from home	.44	10
Truancy from school	.43	07
Police arrest	.41	11
Lying	.40	18
Sex delinquency	.39	11

TABLE 2
Syndrome of Unsocialized Aggressive Behavior

Six Central Traits of Cluster	Mean Intercorrelations with Cluster Traits	Percentage of Cases Showing Trait
Boys		
Disturbing influence in school	.41	13
Violence	.37	08
Fighting	.35	08
Quarrelsomeness	.34	08
Destructiveness	.33	07
Incorrigibility	.32	09
Girls		
Violence	.47	04
Fighting	.43	04
Incorrigibility	.41	06
Temper tantrums	.41	08
Defiant attitude	.41	07
Disobedience	.40	11

The second most pronounced cluster is that illustrated in Table 2. The picture here is one of basic lack of socialization, of hostility and lack of inhibition.

For the sake of the comparison the third most pronounced cluster is presented in Table 3. This is the pattern of internal conflict and we have learned much about it and how to treat it—indeed, it is from the study of this group that modern dynamic psychiatry evolved.

The characteristic psychiatric mistake is to assume that the two preceding clusters must, in some fashion, be variants or special forms of this cluster, rather than phenomena in their own right with their own causes and their own treatment needs.

A characteristic contrast between these types is revealed in Figure 1, in which the individual personality is represented by a circle with a core of primitive impulses, a shell of inhibition and a conscious; socialized outer zone or ego. Excessive inhibitions contribute to internal conflict and to the likelihood of psychoneurotic breakdown. Inadequate inhibitions contribute to psychopathic behavior. In the case of the gang member inhibitions are lacking only toward the outgroup.

A comprehensive brief characterization of the psychopathic syndrome is that of William and Joan McCord's in their book "Psychopathy and Delinquency." Their characterization, which is based on a review of the literature is as follows:

> "The psychopath is asocial. His conduct often brings him into conflict with society. The psychopath is driven by primitive desires and an exaggerated craving for excitement. In his self-centered search for pleasure, he ignores restrictions of his culture. The psychopath is highly impulsive. He is a man for whom the moment is a segment of time detached from all others. His actions are unplanned and guided by his whims. The psychopath is aggressive. He has learned few socialized ways of coping with frustration. The psychopath feels little, if any, guilt. He can commit the most appalling acts, yet view them without remorse. The psychopath has a warped capacity for love. His emotional relationships, when they exist, are meager, fleeting, and designed to satisfy his own desires. These last two traits, guiltlessness and lovelessness, conspicuously mark the psychopath as different from other men" (13).

To echo Doctors McCord. "These last two traits, guiltlessness and lovelessness, conspicuously mark the psychopath as dif-

TABLE 3
The Syndrome of Internal Conflict

Six Central Traits of Cluster	Mean Intercorrelations with Cluster Traits	Percentage of Cases Showing Trait
Boys		
Sensitiveness over specific fact	.36	13
Inferiority feelings	.34	08
Depressed or discouraged attitude	.32	06
Worry over specific fact	.32	04
Mental conflict	.32	04
Unhappy manner	.29	04
Girls		
Inferiority feelings	.41	04
Depressed or discouraged attitude	.39	05
Sensitiveness	.37	07
Sensitiveness over specific fact	.35	10
Daydreaming	.32	05
Crying spells	.32	24

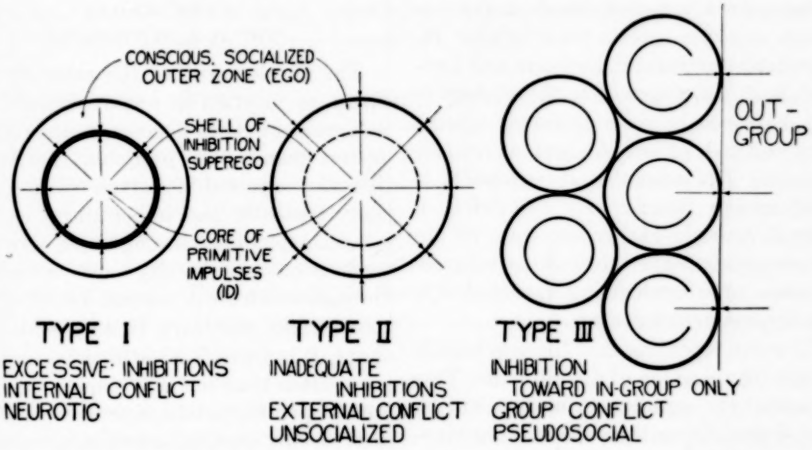
CONSCIOUS, SOCIALIZED OUTER ZONE (EGO)
SHELL OF INHIBITION SUPEREGO
CORE OF PRIMITIVE IMPULSES (ID)
OUT-GROUP
TYPE I
EXCESSIVE INHIBITIONS
INTERNAL CONFLICT
NEUROTIC
TYPE II
INADEQUATE INHIBITIONS
EXTERNAL CONFLICT
UNSOCIALIZED
TYPE III
INHIBITION TOWARD IN-GROUP ONLY
GROUP CONFLICT
PSEUDOSOCIAL

Fig. 1. Representation of three personality types (see text). (This figure and the material in Tables 1–3 are reproduced with permission from the American Journal of Orthopsychiatry.)

ferent from other men." No longer are we wallowing in a morass of diagnosis by exclusion. We have here the central characteristic of the psychopath. Personally I would state it in a slightly different way. *The psychopath lacks the capacity for loyalty and is distinguished from others by this lack.* Through this lack he never attains the identifications of *homo domesticus. The psychopath is a basically unsocialized animal who nevertheless lives in a society.* If, as may happen, he attains some superficial skill with social techniques, his basic lack of social feeling is only the more conspicuous. (Personally I like the term "anethopath," introduced by Karpman, but it has not achieved the popularity it deserves.)

One of the persons to give a great deal of time and careful consideration to the psychopath is Hervey Cleckly (2), who in his book *The Mask of Sanity* lists the characteristic points distinguishing the psychopath as follows:

1. Superficial charm and good "intelligence"
2. Absence of delusions and other signs of irrational "thinking"
3. Absence of "nervousness" or psychoneurotic manifestations
4. Unreliability
5. Untruthfulness and insincerity
6. Lack of remorse or shame
7. Inadequately motivated antisocial behavior
8. Poor judgment and failure to learn by experience
9. Pathologic egocentricity and incapacity for love
10. General poverty in major affective reactions
11. Specific loss of insight
12. Unresponsiveness in general interpersonal relations
13. Fantastic and uninviting behavior, with drink and sometimes without
14. Suicide rarely carried out
15. Sex life impersonal, trivial, and poorly integrated
16. Failure to follow any life plan

You will note that Dr. Cleckly begins his list with attributes which are entirely normal and which simply exclude certain kinds of pathology. The psychopath has superficial charm and good intelligence—which makes it clear that his behavior cannot be explained on the basis of mental deficiency. He lacks delusions and other signs of irrational "thinking." Thus this excludes psychotic disorders such as schizophrenia. There is an absence of "nervousness" or psychoneurotic manifestations—a psychoneurosis does not explain what follows. He is unreliable, untruthful, insincere and antisocial. Such indications as to the etiology of this behavior as he gives us are his egocentricity and lack of love, his lack of remorse and shame. The psychopathic personality is not so much a disorder as it is a defect, a failure of development. In one sense we are all *born* psychopaths. Most of us outgrow this stage of overwhelming egocentricity: some become arrested there.

It is worth repeating that the psychopath is simply the extreme of a continuum. This means that the significant question will be one of degree rather than one of categorization, not, *is* he a psychopath, but rather *how* psychopathic is he? Categorizations are most useful when we deal with relatively noncontinuous distributions. For example, it is convenient to classify adult humans as either men or women, for there are relatively few individuals about whom there need be any real doubt as to which group they belong in. On the other hand, if we classify people as fat or not fat, we will find many individuals who are really difficult to classify. In such cases, while we can struggle to classify each individual either as fat or not fat, the more useful question in an individual instance will probably prove to be, *how* fat is he? In the same way the more meaningful question is not, "Is he a psychopath?" but rather, "How psychopathic is he?" However, for the sake of simplicity in this discussion, we will continue to speak about "the psychopath" (and the reader should bear in mind that we are talking about the extreme of a continuum). Taking then the psychopathic syndrome as something recognizable when it is present in a well-marked form, it would seem that we may reasonably speculate with respect to its cause, and such speculation seems reasonably to lead to the consideration of several causal factors.

PART TWO

WHY IS A PSYCHOPATH?

The development of the capacity effectively to function in social relations is an achievement. It is dependent upon the effective learning of particular patterns of behavior expected in a given culture. Much more basically and importantly, it is dependent upon the learning of positive social motivations of loyalty and attachment through which are developed inhibitions and motivations necessary to successful social living. It is dependent too upon learning that more often than not one reaps what he has sown, upon the actual experience of finding that socially acceptable actions are rewarded and socially objectionable actions are punished. If in the formative period there has been no adequate human response and no logic in life, then it may be understandable that an individual may not only fail to face the future, but may actively refuse to face the future, or to consider the feelings of others.

Man is by nature a social animal. It is, of course, possible that exceptionally, an infant may be born lacking the basic capacity for social responses, just as very exceptionally individuals have been reported who lack the capacity to experience real physical pain. Such occurrences must be highly exceptional, for particularly during the earlier period of human history, either deficiency would render the individual unlikely to survive, and such deficiencies are unlikely to appear now unless either as current mutation or as the emergence of relatively rare recessive character. Doubtless there are differences in the ease with which various people can be domesticated, as in animals. The fact that man is the most thoroughly domesticated of animals does not relieve us of the problems of house-breaking each new generation, nor does it prevent failures of domestication.

Perhaps to clarify our thinking it is worthwhile to consider, in armchair fashion, various elements which might contribute causally to a failure to achieve socialization.

Obviously the brain is an organ important to socialization, and obviously injury to or deficiency of the brain should make the achievement of socialization more difficult and its failure more likely. Some evidence of brain damage or dysfunction is disproportionately frequent among psychopaths. Indeed Dr. G. N. Thompson, in his book *The Psychopathic Delinquent* (16) considers that cerebral injury is an invariable etiological factor in the psychopathic personality. This I believe to be an unwarranted conclusion, but it is certainly reasonable to assume that cerebral injury would make failure to achive effective socialization more likely.

Various investigators have found a high frequency of abnormal electroencephalograms among psychopaths and behavior disorders (6, 7, 15). Ehrlich and Keogh, reporting from Saskatchewan on 50 psychopaths in a mental institution, found that 80 per cent of them showed electroencephalographic abnormalities (3). This certainly suggests a high incidence of brain damage or brain dysfunction. It is of further interest, however, that the 20 per cent who did not show any abnormality of the electroencephalogram were in at least a number of regards the most severe psychopaths. They did not come for treatment but were brought unwillingly to the hospital at an average age older that those with electroencephalographic abnormalities. They were more deviant, more stabilized, showed little evidence of inner conflict and their histories revealed a high incidence of harmful environmental factors.

It is also worth emphasis that the evidences of brain damage and of electroencephalographic abnormality are, for the most part, quite non-specific. Organic damage appears to be a contributing factor, rather than a cause in the usual sense of the word.

However, we should not leave this brief discussion of the electroencephalogram without mention of the phenomenon of theta waves. Theta waves are defined by W. Gray Walter (17) as waves with a frequency of about 4–7 per second. Dr. Walter found that he could induce theta rhythms in normal adults by frustration. According to Walter and Denis Hill theta rhythms are associated with bad temper and aggressive behavior.

Theta waves are reportedly rare in normals, (less than one per cent) but were the dominant rhythm in 18 of 50 psychopaths investigated by Ehrlich and Keogh.

Certainly the most conspicuous element in the histories of individuals showing failure of socialization is their failure in the early years of life to establish any positive emotional rapport with another human being. A comparison was made by Hewitt and myself of the records of fifty-two children referred to a child guidance clinic who showed three or more of the traits, *assaultive tendencies, starting fights, cruelty, defiance of authority, malicious mischief* and *inadequate guilt feelings.* This group of children, which we called unsocialized aggressive, were compared with a total group of five hundred unselected child guidance clinic cases from which they were drawn (5). Our characterization of the differences was as follows. "His mother's own home life in particular has been unhappy. It is likely that she left home at an early age to get away from her own parents and met the child's father. The child is likely to have been illegitimate.

"In any event neither parent wanted the pregnancy and the mother was probably under considerable emotional strain during that period. Labor may have been prolonged or exceedingly difficult and, if so, the suffering the mother experienced only served to increase any existing tendency to reject the child. Both parents, but particularly the mother, denied this child affection from the beginning. Even if the parents married, desertion or divorce is likely to have broken the relationship, with the child being subsequently placed either temporarily or permanently with relatives or strangers or being shuttled from one parent to the other. If the parents remained together, their relationship was fraught with bitterness and disharmony. The mother is likely to have been very unstable, a characteristic not entirely foreign to her husband, who was also deceptive in his dealings with others. Both parents were probably violent tempered and abusive toward each other or the children. The mother, possibly of low intelligence, may also have been addicted to the use of alcohol. She may have been and perhaps still is quite unwilling to accept the responsibilities of motherhood, and has frequently been involved in illicit sex affairs with various men. The family itself is regarded with disfavor by the neighbors and may be known unfavorably throughout the community.

"No other relationships between the members of the family are encouraging to the development of a healthy social attitude on the part of the child. Rarely is authority in this family reasonably divided between the parents. One of them is usually extremely dominating and the other assumes little direct responsibility. The parents quarrel or engage in open fights and what loyalty exists between members of the family is split between opposing factional units. Sexual relationships between the parents are unsatisfactory and contribute to conflict. The status of the child in the home is also a source of conflict. The parents disagree on methods of discipline in which the father particularly is likely to be inconsistent.

"The mother, and to a greater extent the father, will brook no interference from the outside, frequently shielding the child from the charges of school and community authorities. Neither parent, however, is affectionate toward him. They are at most indifferent in their attitudes and the mother is most likely to be openly hostile or rejecting. Little wonder then that he feels unwanted in the home and is ambivalent toward his parents or openly expresses hostility to parents and siblings alike.

"In view of the mother's behavior, it is not surprising that other children in the home may also have engaged in unconventional sex behavior, and it is probable that one or more is officially known to the juvenile court as a delinquent on other counts. As a final note of emphasis, the picture presented is essentially one of generalized and continual parental rejection, and particularly overt maternal rejection, beginning at or before the birth of the child.

"The product of this background is a child of bottomless hostilities and endless bitterness, who feels cheated in life, views himself as the victim although he is constantly the aggressor, is grossly defective in his social inhibitions, or if you prefer, in his superego, and is grossly lacking in guilt sense over his misconduct. We may think of his hostility as springing from three sources. First, there is the hostility of the individual who has a need for and, by common judgment, a right to expect love from his parents and receives none. Even adults who have developed a good deal of social restraint often become hostile and sometimes even violent when they find themselves rejected in a love relationship, and certainly the reaction of resentment and bitterness is natural to a child who is rejected by his mother. Secondly, this child has lacked an effective affectional tie to any adult through which he could incorporate standards of behavior or from whom he could develop a superego. In the third place, the example of behavior this child sees before him is one which is highly selfish and inconsiderate and, by our conventional standards, objectionable if not delinquent. This background has developed a hostile, uninhibited personality, tending to act with direct violence at any provocaion or desire. He has cause for insecurity and cause for anxiety, but the anxiety usually leads him to attack" (5).

A study by Dr. Hilda Lewis (12) of London, has confirmed an association between overt parental rejection and the psychopathic behavior of the unsocialized aggressive child. This association is far beyond that explainable on the basis of chance factors.

A reading of the monograph entitled *Follow-up Study of War Neuroses* by Brill and Beebe (1) suggested that the data used in that study might provide a further opportunity to test hypotheses developed from earlier studies. Among 842 veterans with a service-connected diagnosis of psychoneurosis who were followed up in the study and examined by qualified psychiatrists, 11.4 per cent were diagnosed on follow-up as having a personality or behavior disorder.

The standard history forms prepared on all of these cases were reviewed by at least two of three psychiatrists.[2] Initially the writer reviewed all histories and rated all patients on the absence or the presence and the severity of psychoneurotic symptoms and signs before military service, during military service and at follow-up. This provided three ratings ranging from 0 (no symptoms or signs) to ++++ (extremely severe symptoms). Similar ratings were made on the absence or presence and degree of psychopathic behavior and signs before service, during service and at follow-up.

In the process of this review two sections of the history were not read, the first section on family history and the last section, the final summary of the case. These sections were omitted in order to minimize any chance that a description of the family relationship or family constellation would influence the judgments.

Nine cases were rejected. Of these, three appeared probably to be schizophrenic, three showed strongly schizoid personalities, one gave a history of being hospitalized for a psychosis before service, one was affected by cerebrospinal meningitis and in one case the veteran was antagonistic and the information unsatisfactory. The remaining case histories were seen and rated by one or both of the other psychiatrists.

All raters accepted as the definition of psychopathic behavior and signs those appearing in the description of the *antisocial personality* as it is characterized in the Diagnostic and Statistical Manual of the American Psychiatric Association, 1952.

If the first and second raters did not agree that psychoneurotic symptoms or signs were present at at least one of these three points or absent at all of them, and that psychopathic behavior or signs were present at at least one of these three points or absent at all of them, a third rating was obtained. On the ratings of psychoneurotic symptoms, agreement between the raters was excellent. On the ratings of psychopathic behavior, while the correlation between the raters appeared high, the threshold of the three raters was clearly somewhat different. Since the writer's own ratings were in the middle, they were used except in two instances. (In one instance I rated the veteran as + on psychopathic behavior and signs and the other two raters rated psychopathic behavior and signs as 0. In the other instance, I rated a veteran as showing no psychoneurotic symptoms, and the other two raters rated them as present. In both cases the mean rating of three raters (0 and + respectively) was applied.)

The highest of the three final ratings on psychoneurotic symptoms are plotted against the highest of the three final ratings on psychopathic behavior in Table 4. On the basis of these ratings 54 veterans were considered to show psychopathic behavior and

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[2] The author is grateful for the help of Dr. Reber Van Matre of the Veterans Administration Central Office and Dr. Henry Lyons, then of the VA Hospital, Washington, D. C. He wishes also to acknowledge his indebtedness to Dr. Norman Brill and to Dr. G. W. Beebe for permission to use this material.

TABLE 4

Relation of Psychoneurotic Symptoms and Psychopathic Behavior

Maximum Rating PSYCHOPATHIC BEHAVIOR	Maximum Rating PSYCHONEUROTIC SYMPTOMS 0	1	2	3	4	Total
4		1				1
3	1	1	4	3		9
2		4	8	3	2	17
1	2	2	13	8	2	27
0		5	19	21	2	47
Total	3	13	44	35	6	101

signs, mild in 27 cases, moderate or severe in 27 cases. It is noteworthy that only three cases in this series were judged (by two raters) to be free of psychoneurotic symptoms. It is evident from the table that there was little relation between the rated severity of psychoneurotic symptoms and signs and the rated presence and severity of psychopathic behavior and signs. What slight relationship exists appears to be in a negative direction. In this material it became very clear to all three raters that there is no contradiction in having both severe psychoneurotic symptoms and severe psychopathic behavior.

This subgroup of 54 psychopathic or antisocial veterans with psychoneurotic symptoms was compared with the total group of psychoneurotic veterans on a series of background factors. It is worth emphasis that the comparison is between two groups of veterans who have been diagnosed as psychoneurotic and practically all of whom show psychoneurotic symptoms and signs. One group also shows psychopathic behavior and signs while the other does not.

The findings, in relation to the hypotheses, were as follows.

Rejection by Mother

Hypothesis: A history of maternal rejection will be associated with psychopathic behavior.

Result: The trend is in the predicted direction but is not significant on a population of 26 on whom the necessary information is available ($p < .10$).[3]

Rejection by Father

Hypothesis: A history of paternal rejection will be associated with psychopathic behavior.

Result: The hypothesis is supported ($p < .05$) on a population of 22 on whom the necessary information is available. If we confine ourselves to the 11 individuals with moderate or severe psychopathic behavior on whom we have the necessary information, a level of .025 is reached. Ten out of 11 in this group were entered as rejected as compared with 56 per cent of the total series of 209 on whom this information was available.

Discipline by Mother

Hypothesis: There will be a history of more than average maternal discipline associated with psychopathic behavior.

Result: Hypothesis supported at $<$ .025 level of significance.

Discipline by Father

Hypothesis: There will be a history of more than average paternal discipline associated with psychopathic behavior.

Result: Trend is in predicted direction but negligible ($p < .35$). However, if we restrict our attention to the 21 individuals with psychopathic behavior of moderate or severe degree, we find an association with *excessive* paternal discipline at better than a .005 level of significance.

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[3] In this and following tests a one-tailed distribution is used (unless otherwise specified) because the direction of the difference was postulated in advance.

Evident attitude toward Mother

Hypothesis: There will be a negative attitude toward the mother associated with psychopathic behavior.

Result: Hypothesis is sustained at better than the .01 level. It is sustained at the same level if we confine ourselves to the 13 individuals with moderate or severe psychopathic behavior on whom the necessary data are available.

Evident attitude toward Father

Hypothesis: There will be a negative attitude toward the father associated with psychopathic behavior.

Result: Trend is in the predicted direction, but not significant ($p < .40$). However the entry "mixed attitude" toward father is significantly associated with psychopathic behavior ($p < .001$). (Here a two-tailed distribution was used, as this relationship had not been predicted.)

Religion and family life

Hypothesis: The entry that religion was "no great influence in the home; no comment in adequate history" will be associated with psychopathic behavior.

Result: Hypothesis is supported ($p < .05$). Also, the entry that religion was a "positive force without evidence of excessive restriction or guilt production" showed a trend toward being *negatively* associated with psychopathic behavior ($p < .025$).

Overt sibling rivalry

Hypothesis: A history of overt sibling rivalry will be associated with psychopathic behavior.

Result: The entry "none noted, adequate history" is *negatively* associated with psychopathic behavior at the .01 level of significance. In addition, entries "clear evidence of overt rivalry, mild or moderate" and "clear evidence of overt rivalry, marked" are associated with psychopathic behavior at the .01 level.

Parental conflict

Hypothesis: A history of marked parental conflict will be associated with psychopathic behavior.

Result: Hypothesis was supported at better than the one per cent level.

A third possible factor in the development of the psychopathic personality could be the training of that individual. It is well known that children may be effectively trained in crime, and the tradition of criminal families and criminal classes, *e.g.*, the Thugs of India, has long been familiar. The product achieved by such training, however, is not a psychopath or an unsocialized person, but rather a person who is socialized within a predatory culture and who can be depended upon by the other members of that predatory culture to behave in ways expected of him. This is a result of constant training toward specific and clear expectations of behavior which are considered social within the criminal group. A person who has been able to acquire this pattern, which demands loyalty and dependable courage, is not a psychopath. Indeed a criminal culture tends to eliminate its psychopaths ruthlessly and efficiently.

That is to say, consistent training in a cooperatively predatory or criminal way of life does not produce a psychopath. What appears to contribute more directly to the psychopathic syndrome would be a training situation of confusion. Lack of predictability and of consistency is always confusing and doubtless makes a contribution in this area. A more basic element contributing to confusion has been described by Dr. Stanislaus Szurek and Dr. Adelaide Johnson as it occurs in middle-class families (11). The situation they describe is one in which a parent formally and intellectually supports the community standards of behavior, but at the same time is intrigued by and may actually obtain deep emotional satisfaction from the non-conforming behavior of his child. It is probably inevitable that such a parent should give many cues as to his real feelings, probably for the most part without recognizing the fact. And it seems not surprising that the child may fail to be limited by a formal prohibition when the emotional response of the parent is actually one which sanctions and encourages the forbidden behavior.

One cannot but be impressed by the conspicuous absence of any real socialization in the psychopath. However, the well-developed antisocial reaction of our present psychiatric nomenclature represents more than a mere deficiency—it represents a deficiency in socialization as modified by a morbid and necessarily egocentric compensation.

There are degrees of stability in the psychopathic syndrome, and the more classical psychopath is, of course, the more stabilized psychopath. Such stability is attained by defense mechanisms which reduce any incipient conflict about the psychopathic life adjustment.

If one attempts to treat a classical psychopath, one quickly realizes that he has evolved a set of inner defenses to protect him from any insight or discomfort in his antisocial adaptation to life. One suspects it is not simply that other people have little emotional meaning for him. It is *necessary* to his inner balance and way of life that they *should* have little meaning for him and that such rudimentary truly social impulses as he may have developed be repressed or stifled to maintain this inner balance. His comfort and the stability of his way of life are protected by a kind of morbid homeostasis. It is not simply that he fails to learn truly social responses. He definitely refuses to learn truly social responses for they would destroy his stabilized maladjustment and his way of life. It is for this reason that he rationalizes that everyone is trying to do him dirt—he is no worse than others, but only quicker or smarter.

Just as the professional confidence man armors himself with the perhaps honest rationalization, "I never took anybody who didn't have larceny in his heart," so the psychopath has adjusted himself to regarding the world as a hostile place and to considering other people as tools or objects to be manipulated to secure what he wants. This is not weakness, it is a kind of morbid strength in the service of the devil—a shortsighted devil of profound defensive egocentricity. It is most conspicuous in the psychopath who acquires a superficial skill in ingratiation although he utterly lacks the element of any real socialization.

Thus, we see three elements which, in differing degrees, may enter into the picture of the psychopath. There may be a factor of damage to the organ of adjustment, the brain, which makes more difficult the acquisition of patterns of social behavior and inner social control and of course, it is reasonable to assume that even in the absence of specific pathology of the central nervous system, there are differences, perhaps in the ease with which various individuals born in the genus *homo* may be developed into the species *homo domesticus*.

A second important element is early experience which fosters bitter resentment, suspicion, distrust, and hostility, the experience of parental rejection and particularly of maternal rejection from birth.

A third element may be a confusing situation for social training, a situation confused either by gross unpredictability or even more significantly, by a gross divergence between the formal and the emotional responses of the parent.

If, with some of these experiences and attitudes, the individual is able to acquire some superficial social skill and begins to organize his pattern of behavior around egocentric values, with their characteristic rationalizations and defenses, then psychopathic personality may come into full flower.

Hervey Cleckley, in *The Mask of Sanity*, expresses the belief that the psychopathic personality is a psychosis not technically demonstrable, maximally concealed by an outer surface of intact function and manifested only in behavior. The disagreement I would express with this intriguing definition is that, to me, it strains the concept of psychosis past the breaking point. A psychosis is a major mental disorder. A psychopathic personality shows not a disorder of personality but rather a defect of personality, together with a set of defenses evolved around that defect. The defect relates to the most central element of the human personality: its social nature. The psychopath is simply a basically asocial or antisocial individual who has never achieved the developed nature of *homo domesticus*.

PART THREE
WHAT CAN BE DONE ABOUT IT?

PREVENTION

Measures for the prevention of the development of criminal psychopaths are implied in the discussion of the causes of the condition. The most important element is certainly the support of family life to the end that parents of marginal parental capacity may be able more adequately to deal with their children. In those instances in which it becomes clear that the parent (and particularly the mother) lacks the capacity for parental feeling for and parental handling of the child even with the best support it is possible to give, the child should be removed from the home at the earliest practicable date and a suitable foster home placement arranged.

Mere foster home placement, of course, is not enough. It is necessary that the child should really *take root* in the foster home, that he should develop an adequate child-parent attachment and response. Children who grow up in a changing scene of foster homes, or in the impersonality of an institution are not likely to become adequately socialized. On the other hand, for the relatively uncivilized youngster, some period of "housebreaking" in an institutional setting may be a necessary prelude to successful foster home placement.

While family life is the most important factor, the general level of social behavior, participation and exchange in the community is also important. In this connection the amelioration or removal of social rejection or discriminatory practices which deny to certain groups equal acceptance or participation in the community is particularly significant. While such practices may be partially offset by some compensatory solidarity in the group discriminated against, this solidarity is likely to support rebellious and antisocial acts and in this position to reduce the clarity of the demands of conscience. In this fashion it often contributes to reduce the social commitment of marginal members of the minority group.

Better maternal health and better obstetrics, by reducing the incidence of brain-damaged children, may make a small preventive contribution.

TREATMENT

A number of years ago, with Lester Hewitt, I discussed the treatment of the unsocialized aggressive child. Since the criminal psychopath is the unsocialized, aggressive child who has grown up still unsocialized and aggressive, this discussion seems pertinent. After considering the tolerant accepting treatment which encourages the development of self-tolerance and is useful with overanxious neurotic personalities, we stated.... "This method of therapy is not adapted to the unsocialized, aggressive child.... One does not seek to relieve guilt-anxiety. One seeks to create it. This is done in essentially the way that taboos are planted at any time of life, whether in the early training period of childhood when the process is normally most intense or in later life readjustments as upon induction into the army. It requires the use of authority, firmness, planned limitation, and at times, punishment.

"What is necessary for success is first of all a warm accepting attitude on the part of the parent or parent substitute. This is particularly important with the unsocialized, aggressive child who feels rejected and expects to be rejected. Until one has convinced such an individual of a fundamental interest in his welfare, therapy is not likely to be successful. It often requires an exceptional personality to be able to develop and maintain a high degree of personal warmth for some of these aggressive, unsocialized individuals whom most people are able to describe only in zoological metaphors.

"Having established such a relationship, the next step is to establish and effectively maintain pressure toward required kinds of behavior and against certain objectionable types of behavior. This must be done step by step, often in very small steps. While an effort should be made to develop and exploit personal loyalty to one or more socialized adults, it must be recognized that this child's capacity for loyalty and identification is definitely feeble. The appeal must consequently be oriented in great part in terms of self-interest. Privileges which are abused must be withdrawn and returned step by step. For this reason older children and adolescents who are of the unsocialized, aggressive make-up usually cannot be effectively treated outside of an institution, because adequate control is impossible in the open democratically organized community. Constant reassurance of personal interest and warmth is necessary while particular patterns of behavior are disapproved. The reason that certain requirements are set upon an individual must be explained over and over again and the requirements must be made effective. Authoritative management and limitation which will be experienced and interpreted as punishment are essential portions of the treatment.

"If one attempts to treat the unsocialized aggressive child by the methods suitable for the overinhibited, neurotic, withdrawn child, his behavior will typically get worse. Encouragement of the free expression of aggressiveness does not lead to improvement. An overinhibited person or a person of adequate inhibitions, who in a particular situation has developed special tension, may so relieve his feelings by a cathartic discharge of verbal hostilities, or acted out hostilities, as to be able to function effectively under the control only of his own conscience. This is not true of the child who lacks guilt feelings or any effective conscience. When treatment is undertaken by methods of play analysis, for example, if the therapist encourages more and more outpourings of the aggression, he will find that the well of hostility is bottomless. The therapeutic sessions may be made more frequent, but the hostile, aggressive, wild behavior only intensifies.

"It must be recognized that the unsocialized, aggressive individual will frequently seek to protect himself from developing an attachment for anyone, and may respond negatively when he begins to feel himself becoming attached. This must be accepted as one of the problems of treatment.

"As has been stated, treatment of the adolescent will usually need to be carried out in an institution, the major portion of it by someone who is in contact with the child much of the day. The social situation needs to be simplified by contact with fewer adults and with stable, mature, even-tempered and strong personalities. The maximum simplification should occur at the start, with a step-by-step increase in freedom and responsibility as the child is able to manage them. Psychotherapy has a place, but it is a very different type of psychotherapy than that employed with the overinhibited, neurotic, withdrawn individual. Psychotherapy here will be directed toward helping the patient recognize that his substitute parent is interested in his welfare, is not hostile, but is simply enforcing reasonable restrictions and that the wise course is to take advantage of the constructive opportunities the situation affords. This will have to be repeated over and over again and in different ways. There is an advantage in having a therapist not responsible (in the eyes of the child) for the authoritative decisions, participate or carry major responsibility for this psychotherapy. If this is criticized as superficial treatment, we would respond that it is as much of an error to use deep level therapy in a case requiring superficial treatment as it is to use only superficial treatment in a case which calls for deep level therapy.

"The results of the treatment will be to develop somewhat the inadequate shell of inhibition, to stimulate foresight and an enlightened self-interest, and to develop certain patterns of conformity. If in addition skills are acquired, the prospect for an individual reasonably able to take his place in society may be good. In some extreme instances, only an improvement in the capacity for institutional adjustment may be realized" (**8**).

In the criminal psychopath we are confronted with a combination difficult to treat, a deep and basic frustration which results in an overwhelming egocentricity, a tendency on the part of the subject to view himself as the victim, even though he is in fact the aggressor, and a basic disrespect for and hostility toward the rest of the human race, whom he regards either as his enemies or as his fair game. In addition to this he may have developed some skill at deceiving others and certainly has developed his own rationalization for his conduct, usually on the basis that others are hostile toward him. One cannot but be reminded of the fabled juvenile delinquent who, before sentence for the murder of his parents, appealed for clemency because he was an orphan.

It is necessary to thwart the success of the criminal activities, yet to try to reduce the personal frustration of the subject and to help him realize that there are more satisfying patterns of living available to him. Obviously this is not an easy combination to achieve. Not only must there be effective firmness, effective fairness and effective kindness, but these behaviors must be maintained over a period of time and in the face of quite unjustified hostility and disbelief. Furthermore, even when success attends the effort, its degree will typically be less than that achieved with a more socialized person. However, to the community as well as to the subject, the importance of this degree of success may be very great.

When the milder degrees of psychopathy are associated with criminal behavior, the experience of conviction and of probation skillfully handled may be adequate for stabilizing the individual. With the more severe degrees, institutional treatment will as a rule be necessary. Not that it will necessarily be successful, but that success is highly unlikely without control. The mere fact of the passage of time even in the limited social living of a prison setting is helpful, for it tends to increase social maturity and nearly always increases caution.

While the resources of the institution are not available for the psychopath on probation, the disadvantages and frustrations of the institution are also avoided. In many cases, usually the milder ones (which are more numerous than the more extreme) the combination of resourceful and steady fairness, firmness and kindness on probation can be adequate to the problem.

Various writers have, of course, reported favorable treatment results in individual cases of psychopathic personality. Many of these cases are of real interest, but in the nature of such treatment efforts, they cannot offer evidence of what would have happened without treatment, and the uncertainties remain large.

In 1941 C. W. Mangun published a relatively persuasive account (14) of a treatment program for criminal psychopaths in a federal prison.

A significant evaluation of an organized treatment effort to deal with the defective socialization of the psychopath is included in the McCord's volume on *Psychopathy and Delinquency*. The Wiltwyck School for Boys at Esopus in New York State treats problem boys of the eight to twelve year age group with milieu therapy. The treatment program involves a warm, permissive environment, in which individual and group therapy are combined with an almost one-to-one ratio of staff to boys. An evaluation reveals that with boys classified as psychopaths this therapy resulted in a decrease in their aggressive fantasies and a significant increase in their internalized guilt. They tended, after treatment, to see authority figures as less punitive. There was an increase in positive ego ideals and, in the counselors judgments, of the psychopaths capacity to maintain affectional relations.

Under favorable treatment conditions, and within reasonable limits, the traditional pessimism relating to the treatment of the psychopath does not seem justified and a more optimistic orientation appears warranted. The unrestrained impulsiveness of the psychopath diminishes with age, particularly under favorable circumstances—circumstances in which he is under control which is effective yet is not hostile toward him. Some development of internal controls, or at least of a reasonable caution, can be encouraged by treatment measures, probably particularly by group therapy which encourages him to recognize and seek to control his own contribution to his problem of adjustment.

REFERENCES

1. Brill, N. Q. and Beebe, G. W. *A Follow-Up of War Neuroses.* U.S. Veterans Administration Medical Monograph, 1955.
2. Cleckley, H. *The Mask of Sanity.* 3rd ed. Mosby, St. Louis, 1955.
3. Ehrlich, S. K. and Keogh, R. P. The psychopath in a mental institution. A. M. A. Arch. Neurol. Psychiat., **76:** 286–295, 1956.
4. Hardin, G. The threat of clarity. Amer. J. Psychiat., **114:** 392–396, 1958.
5. Hewitt, L. and Jenkins, R. L. *Fundamental Patterns of Maladjustment: The Dynamics of Their Origin.* State of Illinois, 1946.
6. Hill, D. EEG in episodic psychotic and psychopathic behavior. Electroenceph. Clin. Neurophysiol., **4:** 419–442, 1952.
7. Hill, D. and Pond, D. A. Reflections on one hundred capital cases submitted to electroencephalography. J. Ment. Sci., **98:** 23–43, 1952.
8. Jenkins, R. L. A psychiatric view of personality structure in children. In National Probation Association. *Delinquency and the Community in Wartime.* The Association's Yearbook, 1943. (This reference contains a slightly revised form of a treatment discussion in citation no. 5.)
9. Jenkins, R. L. and Glickman, S. Common syndromes in child psychiatry. Amer. J. Orthopsychiat., **16:** 244–261, 1946.
10. Jenkins, R. L. and Hewitt, L. Types of personality structure encountered in child guidance clinics. Amer. J. Orthopsychiat., **14:** 84–94, 1944.
11. Johnson, A. M. and Szurek, S. Etiology of antisocial behavior in delinquents and psychopaths. J. A. M. A., **154:** 814–817, 1954.
12. Lewis, H. *Deprived Children.* Oxford, London, 1954.
13. McCord, W. and J. *Psychopathy and Delinquency.* Grune & Stratton, New York, 1956.
14. Mangun, C. W. The psychopathic criminal. J. Criminal Psychopath., **4:** 117–127, 1942.
15. Silverman, D. The electroencephalograms of criminals. Arch. Neurol. Psychiat., **52:** 38–42, 1944.
16. Thompson, G. N. *The Psychopathic Delinquent.* Thomas, Springfield, Ill., 1953.
17. Walter, W. *The Living Brain.* Norton, New York, 1953.

SPONTANEOUS ENDOGENOUS OSCILLATING SYSTEMS IN AUTONOMIC AND METABOLIC EFFECTORS: THEIR RELATION TO MENTAL ILLNESS

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Experience with the kinetic observation of autonomic and metabolic responses in both healthy and mentally disturbed subjects has shown that it is seldom possible to record unchanging levels in any of the considerable numbers of monitors employed. In most reported work on the resting status of autonomic variables, initial values have been recorded and the observation time has been short; where longer observation times have been used, either an average of the changing values or the last observation has frequently been taken as the "resting value." Yet, in biological phenomena, static unchanging values are associated with death; in living organisms there is always change both in adaptive response to threat and also at rest where the pulse of life beats to characterize the uniqueness of the individual or his species.

This paper reports a series of observations of the autonomic and metabolic status of several groups of mentally ill patients at rest. The data show the existence of regularly recurrent oscillations of a frequency characteristic for the type of psychiatric disturbance suffered by the patient. The results will be discussed in terms of their apparent psychophysiological implications and in support of a biological theory of mental illness.

THE EXPERIMENT

Subjects: A total of 182 hospitalized psychiatric patients was investigated. Included were 91 cases of schizophrenia, 38 of organic brain disease, 16 of manic-depressive psychosis, eight of involutional melancholia, 15 of epilepsy and nine of a mixed group of miscellaneous minor psychiatric conditions, consisting in the main of neurosis and psychopathic personality. The *sexes* were reasonably evenly balanced, with 82 males and 100 females. *Ages* ranged between 14 and 82 years; means and standard deviations for each diagnostic group being respectively as follows: schizophrenia, 41.03 (1.47); organic brain disease, 56.95 (2.21); manic-depressive psychosis, 55.75 (3.36); involutional melancholia, 61.62 (2.54); epilepsy, 33.21 (2.23); minor disorders, 41.73 (4.52) years. *Duration of illness* varied widely, from one month to an exceptional 55 years. Means and standard deviations respectively for each diagnostic group were as follows: schizophrenia, 12.73 (1.11); organic brain disease, 8.08 (1.35); manic-depressive psychosis, 12.00 (3.44); involutional melancholia, 2.75 (0.629); epilepsy, 18.33 (2.00); minor disorders, 10.82 (2.17) years. All investigations were carried out at the Ontario Hospital, Queen Street, Toronto, through the courtesy of the Medical Superintendent, Dr. J. N. Hagen, and under the aegis of the Department of Psychiatry, University of Toronto. All patients were diagnosed independently of the investigation by Dr. A. Miller, Clinical Director of the Ontario Hospital and these diagnoses were all final diagnoses arrived at on the patient's discharge from hospital, or firm diagnoses reached as a result of continued observation and after presentation of the patient at a case conference. Patients who were suffering from intercurrent complicating conditions, those in whom two or more diagnostic labels had been attached, those in the acute stage of recovery from various physical treatments or procedures, and those who were grossly uncooperative, were excluded from the experiment. (Nonetheless, it proved impossible to carry out every procedure on every patient, and hence the numbers of patients in the diagnostic classifications in the accompanying Tables do not always tally.)

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Technically the investigation proved a formidable task. Each patient was investigated individually and at rest in a longitudinal fashion separately for each of six physiological monitors. No set time was allotted to any one procedure but observations were taken at regular 15, 30 or 60 second intervals until the oscillatory nature of the response was obvious, and then they were continued until at least four distinct and regular recurrences of the periodicity had been distinguished. Sometimes 30 minutes were sufficient for a recording from a single monitor; on occasion such a recording would proceed for several hours. At these rates of progress it was possible to process only one or at most two patients a week and it actually took over two years to complete the examinations of the present series of patients.

Monitoring procedures: These were chosen because they represented means of tapping both significant metabolic as well as autonomic phenomena occurring spontaneously in the organism, because no selected procedure offered any challenge or threat to the patient, and because each procedure could be employed continuously or regularly discontinuously without loss of accuracy. All examinations were carried out in the same "standard room" situation, between the hours of 9:00 a.m. and 4:30 p.m with a luncheon break between. Work proceeded throughout the seasons but, in order to control any possible climatic effect patients were taken indiscriminately of diagnostic grouping, no group thus being penalized by seasonal changes.

Skin temperatures: These were recorded at 15-second intervals from the dorsal skin covering the second phalanges of the middle and ring fingers by means of a Baird-Hardy dermal radiometer. *Capillary blood pressures* were taken every 15 seconds from the skin of the dorsum of the hand covering the first to third metacarpals. The method was an indirect one using the Hooker capsule technique (7). *Alveolar carbon dioxide tension* was measured at 1-min. intervals from alveolar gas samples passed by the previously trained subject into a CO_2 gas analysis apparatus and immediately estimated (12). *Capillary blood-oxygen saturation* was measured oximetrically every 60 seconds. The method was that of spectroscopic oximetry (10, 11) and the site of examination the minute vessels of the skin of the nailfold of the ring finger. Results were expressed in their raw form as reduction time (RT) seconds. *Capillary blood flow* was estimated by stroboscopic timing of the corpuscular speed or red cells within the microscopically observed capillary vessels of the nailfold skin (8). This method (15) is one of great accuracy and provides a moment by moment expression of blood flow in minute vessels of calibers seen in true capillaries, precapillaries and sometimes if desired, even of metarterioles. Blood flow in metarterioles and arterioles of the skin is, however, better given by changes in skin temperature (10, 11). The last monitoring procedure was one that reflects the *metabolic status of the tissue cells of the skin.* The method involves the microscopic *in vivo* observation of the intervascular substance (GS) lying beyond and between the vascular elements of the nailfold skin. Continued observation in this area reveals progressive and reversible changes in homogeneity, refraction, relative opacity, pigmentation, and granularity. At times, vacuoles, pigment threads, highly refractile, opalescent, globular elements and other phenomena make their appearance. Also at times, color changes come about with a kaleidoscopic shimmering pattern of dusty pink or dull orange hues giving place to a milky whiteness or dull grey of somber overall tint. Invariably these changes occur in stages, worsening gradually and then returning to a more normal appearance. Alongside the tissue changes mentioned, inhibition of water by the cell during the worsening process may be inferred from the progressive overlapping of the capillary by the intervascular tissues leading to an obscuration of the vascular elements at the nadir of the periodic change. As invariably the pathology commences at a distance furthest from the tip of the capillary loop, while the reverse process bringing back the tissue to a more normal appearance seems to commence at the tip of these loops. Experience has enabled us to classify these changing tissue states into 10 grades; a brief description of them is given in Table 1. The observations were made continuously and the metabolic implications are discussed later in this paper.

Statistical treatment of the results: The experimental design permitted analyses of variance and of covariance to be employed on nearly all the variables examined, including those of age, sex and duration of

TABLE 1

Rating Scale for Ground Substance (GS) Transformation: Nailfold Skin Microscopy

Pathologic Change	G.S. Category	Description of Microscopic Field
"Normal"	1	Milky white, transparent with all structures well outlined. Capillaries appear as if superimposed on deeper level cells. Whitish color with occasional small splits.
	2	As above but with small pigment threads.
"Congestion"	3	Dark brownish area surrounding capillaries. G.S. is granular and moist.
	4	Redness added to above, the depth of color obscuring the granules.
"Cloudy swelling"	5	Beige pink G.S. has a cloudy bulging quality, like overhanging mountains. Fine granularity.
	6	A homogeneous blanket of brown leathery appearance obscures all but the tips of the capillaries.
"Hydropic Degeneration"	7	Glassy pink homogeneous hyaline appearance around SPP venules and pre-capillaries. Maybe with vacuoles and occasional refractile droplets.
	8	As above plus a columnar appearance, with the murky redness of congestion, running down the limbs of capillary loops and inter-capillary spaces (associated with plexus dilatation and rising skin temperature).
	9	Ground substance assumes a yellowish homogeneous discoloration. Sometimes coarse granulation is seen, the granules being dark brown in color.
	10	A deep gray or pinkish, uniform, homogeneous haze or fog filling in the inter-capillary spaces. Sometimes the capillary loops may be seen shining through this but flow is invisible.

illness. An exception was the tissue changes (GS). Since categories were used for this variable, the chi-square technique was employed to test the significance of differences.

The experimental design lent itself beautifully to the application of multivariate analysis of the results and the data would doubtless have yielded much greater information had this technique been practicable. Disappointingly, the limited extent of the patient's cooperation prohibited complete across-the-board estimations of all variables in all cases and precluded the comprehensive use of this statistical method. An example of its usefulness is however given below, employing those measures in which a reasonably complete survey was possible.

In this paper only the frequency of the periodicities has been analysed; the significance of amplitude variation will be published at a later date. Frequency was determined by measuring the time taken for the monitoring variable to complete one entire sine-wave cycle. Since several cycles were always recorded for each monitor, each separate cycle was measured and an average computed as representing the periodicity to the nearest half minute. Actually in the vast majority of cases this was quite unnecessary for the differences between cycles many minutes in length was seldom a matter of more than 30 seconds.

Clinical observations: Apart from the question of psychiatric diagnosis (established by an independent observer team), close attention was continuously given to the patient's changing mental state and psychomotor activity. Especial note was taken of seemingly spontaneous generation of emotion, and its nature and expression. In addition, a quantified idea of the extent of the patient's illness burden was obtained by scoring a Malamud-Sands Psychiatric Rating Scale (26) for each subject in terms of his two to four days total test period. This aspect of the observations will also be reported elsewhere.

Testing situation for resting observations: Patients were invited to the examination room "for tests." No explanations were given unless called for and the testing was carried out in silence. If questions were asked, notes were made of them and of their timing within the cycle observed; the questions were answered simply but accurately and in a way which discouraged further questioning. Patients were not specifically requested to remain silent, rather was there a tacit and passive assumption that they would do so. The examination room was located in a quiet part of the Hospital and disturbing noise was rare. Subjects were examined in a sitting position and in a padded arm chair. They were urged to make themselves as comfortable as possible. Recording instruments were arranged on the table at which the subject and investigator sat, each on opposite sides.

RESULTS

POSSIBLE INTEFERING BACKGROUND VARIABLES

As has been stated age, sex and duration of illness were the principal background variables considered aside from diagnosis. Analyses of covariance were applied separately to age and duration of illness; no significant effects were found for any of the physiological monitors employed. Tested similarly, sex was found to possess some differentiating properties but these were relatively unimportant. A difference in the oximetric (RT) results between males and females was observed but was significant only at the 0.05 level of confidence ($F = 5.23$; d.f. 1 and 160). The main interference by sex was seen in relation to the tissue change periodicities (GS). Here the overall means and standard deviations were 8.13 ($SD = .2786$) for the males and 4.91 ($SD = .3889$) for the females. This yielded a difference of 3.22 mins. and an F ratio of 8.79. With 1 and 103 degrees of freedom, p is .01 and hence significantly against a chance relationship. In all other cases no significant differences betwen the sexes was found.

THE EFFECT OF PSYCHIATRIC DIAGNOSIS

Frequency of recurrence varied from about two mins. in the case of the epileptic patients to more than 10 mins. for the schizophrenics, the remaining diagnostic groups clustering between these extremes. Tables 2 through 7 list these means and their significance for each of six monitors. In the computation of the analyses of variance, the F ratios were obtained by pooling the sums of squares for diagnosis and sex. Since the variances tended to be unstable in some instances, these figures are given in the tables. As can be seen, five of the six physiological monitors showed periodicities significantly differentiating the diagnostic groups.

TABLE 2

Oximetric Capillary Blood-Oxygen Saturation (RT) Periodicities, by Diagnosis

Diagnosis (ignoring sex)	N	Variances (within sexes)	Means (minutes)	Fiducial limits (.01)
Minor disorders	9	13.17	7.33	±3.6
Manic-depression	16	8.53	7.31	±2.7
Invol. melancholia	8	13.74	6.38	±3.8
Schizophrenia	87	24.99	10.77	±1.2
Epilepsy	15	1.92	2.53	±2.8
Organic brain disease	37	7.89	4.27	±1.8
Test of significance	F ratio 19.56 d.f. 5 and 160 $p < .001$			

TABLE 3

Skin Temperature Periodicities, by Diagnosis

Diagnosis (ignoring sex)	N	Variances (within sexes)	Means (minutes)	Fiducial limits (.01)
Minor disorders	6	.31	4.67	±5.273
Manic-depression	10	11.30	5.50	±4.084
Invol. melancholia	5	36.67	6.40	±2.888
Schizophrenia	44	38.81	10.80	±1.947
Epilepsy	11	10.28	3.45	±3.895
Organic brain disease	22	7.53	3.14	±2.754
Test of significance	F ratio 10.41 d.f. 5 and 86 $p < .001$			

TABLE 4

Capillary Blood Pressure Periodicities, by Diagnosis

Diagnosis (ignoring sex)	N	Variances (within sexes)	Means (minutes)	Fiducial limits (.01)
Minor disorders	4	29.25	6.75	±4.841
Manic-depression	11	4.30	6.55	±2.921
Invol. melancholia	5	9.72	6.50	±4.330
Schizophrenia	25	26.90	9.33	±1.937
Epilepsy	10	1.30	1.60	±3.062
Organic brain disease	20	4.43	2.95	±2.166
Test of significance	F ratio 9.48 d.f. 5 and 63 $p < .001$			

TABLE 5

Capillary Blood Flow (Corpuscular Speed/sec.) Periodicities, by Diagnosis

Diagnosis (ignoring sex)	N	Variances (within sexes)	Means (minutes)	Fiducial limits (.01)
Minor disorders	6	10.67	6.67	±5.114
Manic-depression	11	40.71	7.64	±3.778
Invol. melancholia	7	119.75	5.71	±4.737
Schizophrenia	68	26.91	9.03	±1.520
Epilepsy	17	.79	2.35	±3.039
Organic brain disease	31	6.33	4.06	±2.250
Test of significance	F ratio 8.06 d.f. 5 and 128 $p < .001$			

Inspection of the mean periodicities of each of the six monitors considered (*i.e.*, RT, Skin Temperature, Capillary Pressure, Capillary Blood Flow, pCO_2 and GS) suggested a practical identity of all of them for any one diagnostic group. This was tested by analyses of variance applied to each of the six diagnostic categories. In no case was a significant difference found between them or among them. Table 8 lists these data and gives these representative mean periodicities typifying our six categories of mental illness.

Further inspection of these representative group means suggests that, despite the six illness categories, there are really four distinct periodicities operating. The group means of these would be, in ascending order of time: Epilepsy **2.61** (SD = **.213**) mins.; organic brain disease **3.80** (SD = **.217**) mins.; minor disorders and both categories of psychotic depression **6.80** (SD = **.409**) mins.; and schizophrenia **9.94** (SD = **.306**) mins. The differences between each pair of these means were tested for significance. This hypothesis found support. The following differences were significant at the .01 level of confidence at the given fiducial limits: Organic dementia and epilepsy **1.19** ± **.82**; organic dementia and minor disorders with depression **3.00** ± **1.20**; minor disorders with depression and schizophrenia **3.14** ± **1.38**.

Normal subjects were not included in the experimental design of this investigation but, to provide a proper perspective to these results on psychiatric patients, frequency analysis of the spontaneous oximetric oscillations was made on a group of **18** healthy subjects under identical resting conditions. The subjects were equally divided as to sex and contained three males and three females in each of three age groups: **18–29**, **30–49** and **50–70** years. Results showed a mean periodicity of recurrence of **6.83** mins. (SD = **1.55**) and no differences attributable to either sex or age. It can therefore be inferred that probably no differences exist for the autonomic and metabolic monitors here considered between the mentally healthy and patients suffering from minor psychiatric disturbances or from manic depressive psychosis, depressive type or from involutional melancholia.

TABLE 6

Intervascular Skin Tissue Cellular (GS) Periodicities, by Diagnosis

Diagnosis (ignoring sex)	N	Variances (within sexes)	Means (minutes)	Fiducial limits (.01)
Minor disorders	4	6.34	3.75	±5.710
Manic-depression	11	8.72	6.55	±3.443
Invol. melancholia	6	11.50	6.00	±4.660
Schizophrenia	53	30.68	9.73	±1.569
Epilepsy	14	2.53	2.64	±3.053
Organic brain disease	26	7.64	3.56	±2.199
Test of significance	F ratio 10.32 d.f. 5 and 102 $p < .001$			

TABLE 7

Alveolar Carbon Dioxide Tension Periodicities, by Diagnosis

Diagnosis (ignoring sex)	N	Variances (within sexes)	Means (minutes)
Minor disorders	4	8.92	9.75
Manic-depression	7	52.33	9.00
Invol. melancholia	3	14.34	5.67
Schizophrenia	24	21.73	9.08
Epilepsy	3	8.33	4.67
Organic brain disease	9	5.45	5.22
Test of significance	F ratio 1.58 d.f. 5 and 44 p is NS		

A STATISTICAL INJUNCTION

The F ratio and fiducial limits in each case were calculated using the pooled error over all diagnostic classifications (thus assuming a constant variance). In several cases the variances were so different as to

TABLE 8

Mean Periodicities of Six Monitors, by Diagnosis

Diagnosis	N	Mean (minutes)	SD	F ratio	d.f.	p
Minor disorders	33	6.82	.174	1.74	4 and 18	NS
Manic-depression	66	7.17	.427	<1	—	NS
Invol. melancholia	34	6.06	1.07	<1	—	NS
Schizophrenia	301	9.94	.306	<1	—	NS
Epilepsy	70	2.61	.213	<1	—	NS
Organic brain disease	146	3.80	.217	1.59	5 and 134	NS

make this procedure hazardous, probably making the differences apparently more significant than they actually were. Thus although the F values are misleading and the fiducial limits approximate, even if the variance heterogeneity were taken into consideration in making significance tests, there is little doubt that real differences would be demonstrated at the 0.001 level. However, the variability of the variance requires a great deal more attention than can be given to them on the basis of these data. Perhaps in future studies where there are more individuals per diagnostic category and where it is easier independently to estimate a sex effect, an analysis of variance of the variance could be performed. Analyses of the present type are more a search for clues and information than an experiment designed to test explicit hypotheses.

RESULTS OF A PARTIAL MULTIVARIATE ANALYSIS

The following example is an illustration of the use of multivariate analysis. This type of analysis has been largely ignored in psychiatric problems probably because of the complexity of the calculations involved and because the data must consist of sets of simultaneous observations on each subject. Multivariate analysis is initially descriptive, serving to link sets of monitors together so as to discriminate maximally between groups of people in an effort to discover an underlying biological causal system. Its logic is the same as that of diagnostic reasoning. The variables used in multivariate analysis should have some *a priori* biological significance in combination or there is a danger of basing inferences merely on internal relations of the data as occurs, *e.g.* in factor analysis.

Example: Consider the following frequencies taken from the results reported above in this paper.

Let w = oximetric cycle
x = skin temperature cycle
y = blood flow cycle
z = ground substance cycle

male schizophrenics $N_1 = 23$

$\bar{w} = 12.783 \quad \bar{x} = 11.652 \quad \bar{y} = 10.000 \quad \bar{z} = 10.696$

male organic brain disease $N_2 = 14$

$\bar{w} = 4.625 \quad \bar{x} = 2.786 \quad \bar{y} = 3.464 \quad \bar{z} = 3.000$
difference $8.158 \quad 8.866 \quad 6.536 \quad 7.696$

The pooled sums of squares and cross-products are:

$$S_{ww} = 672.254; \quad S_{xx} = 772.952;$$
$$S_{zz} = 661.333; \quad S_{wx} = 164.572;$$
$$S_{wz} = 197.88; \quad S_{xy} = 192.89;$$
$$S_{yz} = 112.875$$
$$S_{yy} = 632.857,$$
$$S_{wy} = 16.81,$$
$$S_{xz} = 294.32,$$

The corresponding variances and covariance are obtained by dividing these quantities by 35.

The best combination of the above variables is

$L = .331\,w + .195\,x + .280\,y + .173\,z$
with $\theta_m = 1.8975$.

A value of θ associated with a linear function containing only two of the above terms is significantly lower than θ_m at the .05 level of $\theta - 1.40$, and at the .01 level if $\theta = 1.17$.

The following tabulation gives the results of combining these variables two at a time:

$L = .344w + .328x \quad \theta = 1.42$
$L = .434w + .373y \quad \theta = 1.49$
$L = .334w + .307z \quad \theta = 1.27$
$L = .337x + .259y \quad \theta = 1.16$
$L = .297x + .275z \quad \theta = 1.18$
$L = .298y + .356z \quad \theta = 1.16$

Thus only the combination of w, x and w, y deviate maximally between the two groups at the .05 level. Other combinations of two variables have values of θ significantly lower at the .05 level. Similarly it can be shown that the combination w, x and w, y differ more between the two groups than any single factor w, x, y, or z at the .01 level.

A formal inference from this finding, therefore, would appropriately be that the oximetric cycle of capillary blood-oxygen saturation oscillation coupled with either the cycle of oscillation of skin temperature or with corpuscular speed best of all characterize the differences between these two diagnostic groups of psychiatric patients. This would mathematically suggest a causal or interacting physiological relationship between these pairs of monitors. Such a conclusion admittedly might be deduced also from the nature of the monitors themselves, since they were chosen for the investigation deliberately to assess the relative functional efficiency of the minute vessels, and it might be anticipated that a function such as the capillary blood-oxygen saturation could be derived biologically only *via* the flow of blood through the arterioles and metarterioles (estimated indirectly by radiometry of the skin) and *via* the capillary vascular elements themselves (monitored directly by microscopic observation and precise timing of corpuscular movement within sampled nailfold true capillaries). Nonetheless such confirmation is helpful both because of the occasional criticism of what is actually measured by spectroscopic oximetry (**31**) and because, in certain psychiatric conditions, it seems probable that a paradoxical relationship may exist due to the uneconomic operation of an A-V shunt system permitting a by-pass of blood short-circuiting the capillary network (Doust, unpublished observations).

DISCUSSION

Endogenous spontaneous periodicities which are independent of light-dark sequences and temperature gradients have been recognized in plant forms for at least 200 years (**32**). They have been monitored by observing growth activity cycles, turgor pressure, respiration, spore discharge, leaf movements etc., and it is apparent that such built-in, genetically endowed, self-regulating, oscillating systems are universal characteristics of plant cell. E. Bünning (**3, 4**) has provided excellent reviews of the evidence for this, his own experiments suggesting that external stimuli act by desynchronizing the separate self-regulating periodicities of individual cells, thus inducing an overall rhythm.

Similarly ubiquitous spontaneous endogenous periodicities are found in the animal kingdom. Wahl first observed them in bees in **1932** (see **30** for refs.) and the subsequent literature upwards from unicellular forms has been reviewed recently by Pittendrigh and Bruce (**28**). In the higher metazoa, and especially in mammals and man, it is natural to think of "timing devices" such as those responsible for spontaneous periodicities as located in some part of the nervous system. Since such clocks exist in plants and unicellular animals, it is obvious that this need not be. Yet with the differentiation of neural structures in higher animals, some centralization of these functions seems to have taken place. This is not to say that time analysis is not still inherent in tissue cells of these higher creatures, but rather that their nervous systems have taken over the perception, integration and analysis of information supplied by non-neural tissue.

SPONTANEOUS ACTIVITY IN MAMMALIAN BRAIN CORTEX EXPLANTS

C. M. Pomerat (**29**) succeeded in growing embryonic oligodendroglial cells in tissue culture and observed, by time-lapse cinematography, an endogenous recurrent pulsation every 4–5 minutes in them. This spontaneous activity was confirmed by Wooley in Murray's laboratory (**2**) and formed the basis for Wooley's hypothesis of a new function for these cells: that of a natural pump facilitating the transfer of nutrient materials from the relatively sparse paraneural capillaries to the nerve cells and waste products from cell to capillary vessel. Very recently, Geiger (**17**) has offered further confirmation of spontaneous activity in oligodendroglial cells and has succeeded in pushing these frontiers much further forward. She reports slowly pulsatile movements of the perikaryon and neurites' cytoplasm, maximal in the axon, rhythmic changes in size and optical density of the nucleus and nucleolus, a recurrent transfer of nucleolar substance into cytoplasm and a polar movement of nucleolar satellites to and from the nucleolus and nuclear membrane. Perhaps most intriguing of all were the observations concerning the periodic coming together of neurones, for Geiger (**17**) noted in her paper that from time to time the processes of one neurone would become orientated toward the cell body or processes of another. Some contacts might be completed as cytoplasmic bridges; others with classical *boutons terminaux*. In this latter type of synapse, the spontaneous oscillations were more rapid than in the former and rhythmic activity was found characterizing the movement of the thicker endings of the neurites, of the fine fibers and end feet and of the mitochondria and other granules of the end feet. It is obvious how important to the possibility of forming neuroanatomical patterns of association such spontaneous cellular activity must be.

Our own findings reported here of spontaneous activity in tissue cells are, of course, much less neat than those of Pomerat or Geiger (**17, 29**). For one thing, they refer to skin cells rather than those of the nervous system; for another, convincing photographs like those of the previous workers are not possible, since the technique of satisfactorily photographing unstained yet colored changes through many layers of tissue still eludes us. Nonetheless, anyone familiar with the technique of incident light nailfold microscopy cannot but be impressed by the recurrent changes occurring simultaneously in the intervascular "ground substance"; and the inference that this "substance" actually represents those epithelial cells seen in stained sections of the skin in similar apposition to the capillary blood vessels would seem a reasonable one. What we have done is to rate these changes against a ten-point scale of increasing pathology (Table 1) and to draw attention to our impression that the degeneracy of the tissues seen in the higher categories closely resembles every pathological description of reversible cellular degeneration ("cloudy swelling"; "hydropic degeneration"). Seemingly also it follows upon the tissue anoxia which is the common denominator of cellular degeneration, for these "ground substance" changes in our experience come about as a consequence of a falling capillary blood-oxygen saturation, and a diminution in the rate of flow of erythrocytes within the capillary vessels supplying these skin tissue cells. The appearance of cellular degeneration are most marked when the capillary blood flow ceases and the oximeter shows a trough in the oxygen saturation values; it tends to reversal, to a greater or lesser extent, when the erythrocytes start moving again and the oxygen saturation rises. It disappears completely at maximal flow rates and optimal blood-oxygen saturation values. That these changes occur in cycles with a predictable periodicity that is characteristic for the individual examined and the condition from which he is suffering at the time of that examination seems no longer surprising, for we should expect such a rhythmic pattern in all biological cellular systems wherever they occur. Of more moment is the meaning to be attached to the present findings that the periodicities of these phenomena vary in frequency in different types of mental illness. We shall return to this question later in the discussion.

SPONTANEOUS BIOLOGICAL ACTIVITY IN THE INTACT NERVOUS SYSTEM

In 1955 Ragnar Granit (**19**) provided the first review of evidence for the existence of spontaneous activity in sense organs. The first piece of experimental work was accomplished by E. D. Adrian (see **19** for refs.) who noted regular spontaneous discharges in the optic nerve of the eel and the optic ganglion of the water beetle. Granit (**19**) himself worked principally with the retina and he first demonstrated spontaneous activity in this sense organ in **1941** by observing rhythmic discharges uninfluenced by light the firing of which provided a background against which the light-sensitive discharges took place. Granit's review shows that spontaneous rhythmic activity occurs also in cells of the olfactory bulb, the skin, ear and even chemoreceptors such as the carotid body and he concludes that such endogenous discharges are present in "all types of animal as if this activity were part their normal pattern of behavior." Indeed, even if such activity had not yet been demonstrated, it would have had to be assumed for without spontaneous background activity perception would be seriously imperiled. It would be impossible, for example, for cortical activity to be maintained as it is even in the absence of afferent impulses, for the perception of a "silent" sense organ, and for the provision of a patterned series of impulses the significance of which may be discriminately evaluated.

On the basis of his work with the retina, Granit (**19**) defined the function of this spontaneous activity. It permits the rotation of activity among individual sensory units; it permits the maintenance of central excitability when exogenous stimulation is lacking; it provides an energizing system direct to the striatum which is independent of sensory input; *and it contributes importantly toward maintaining the waking state of awareness through different extra-lemniscal pathways joining the mesencephalic, diencephalic and thalamic ascending reticular activating systems and acting as desynchronizing arousal mechanisms.*

Based on their own experiments which demonstrated spontaneous periodic activity in the autonomic nervous system using monitors measuring skin resistance and heart rate, Lacey and Lacey (**24**) have presented an admirable neurophysiological discussion linking CNS wih ANS. While incomplete as a summary of the literature and geared primarily to their effort to link spontaneous periodic autonomic activity with hyperkinesia, Lacey and Lacey's review establishes the plethysmographic findings of Burch and his co-workers (**5**) as a pioneering investigation in this field and strongly presses the analogies with the sensory receptor findings summarized by Granit (**19**) by demonstrating that spontaneous autonomic activity is non-specific, that it increases during non-resting conditions, is predictive of autonomic activity during non-resting conditions and is relatively poorly correlated with levels of "sympathetic tonus." They conclude that their evidence complements that marshalled by Granit (**19**) and that autonomic effectors are as capable as other cell aggregates in evoking potentials "spontaneously" which will discharge periodically at frequencies unique to themselves. These potentials are part of the innate "biological noise" of the organism yet are as capable as their CNS counterparts of desynchronization by temperature, pH, chemical and environmental change.

To the spontaneous oscillations of blood flow implied by the volume changes monitoring the finger tip, toe tip and pinna described by Burch *et al.* (**5**) in their resting healthy subjects and the similar oscillations reported by the Laceys (**24**) for skin resistance and heart rate, must be added for our purposes periodicity in eccrine sweat secretion (**23**), vasomotion and the rhythmical filling and emptying patterns of nailfold capillaries (**27**) and the periodic opening and closure of pre-capillary sphincters (**6**). Since this background literature has been covered more fully elsewhere (**6**), the above brief reference to it will suffice to justify our extension of it to include the monitors used in the present paper.

PSYCHIATRIC AND BEHAVIORAL IMPLICATIONS OF FREQUENCY ANALYSIS

The plethysmographic findings of Burch and his co-workers (**5**) were interpreted by them principally in terms of amplitude analysis. Recurrent high amplitude oscillations were found to characterize subjects of labile mood while low amplitude records in which oscillation was only just perceptible were found in subjects of stable mood and relatively uninfluenced by environmental change. These conclusions were confirmed by the Laceys **(24)** and are reminiscent of Gastaut's **(16)** similar attempts to distinguish personality variables by means of the EEG.

In discussing their own results in terms of frequency, Lacey and Lacey were led to conclude that "a crucial dimension of the observed personality correlates of frequency of autonomic variation was a form of hyperkinesis, and a related oversusceptibility to environmental stimulation." In terms of the results reported in the present paper and in a previous pilot one **(15)** this conclusion appears a reasonable one. The extremes of frequency in our six populations were given by the patients with epilepsy and those with schizophrenia. On the above hypothesis, long periodicities would be associated with excessively low susceptibility to environmental stimulation and hypokinesia—both classical correlates of many varieties of process schizophrenia, while the converse is also as true of the epilepsies.

A second dimension of interpretation is given by the results of frequency analysis in the difficult field of gross behavior. Hans Thomae **(30)** has provided a summary of the work of Lehr, Erfmann and Schapitz on the behavior of three groups of children aged **1–3**, **2–4**, and **4–6** years respectively. Intensive minute-by-minute recording of the spontaneous play, *e.g.* of the **1–3** year age group by Lehr, showed that, when the child's motion was broken into definite areas (motor activity, object of play, area of space used and general level of activity), periodic repetitive patterns can be discerned. In this research "periodicity" was defined as the existence of two or more repetitions of identical activity and such patterns were found characteristic of "inner-determined," constitutionally based behavior, as opposed to environmentally based, "outer-determined" behavior which Lehr found to be characteristically aperiodic and sporadic. As Thomae points out, these observations make possible the investigation of the relative importance of constitution and environment (nature *vs.* nurture) in a scientific fashion.

A third dimension is posited on the basis of our choice of capillary vascular, metabolic and cytologic monitors. The finding in patients with schizophrenia of an overall excessively prolonged recurrence time for capillary hydrostatic pressure, capillary blood-oxygen saturation, arteriolar blood flow, and within-capillary corpuscular flow rate implies an increased time spent at the trough of a continuously repetitive sine wave cycle. Since each of these monitored functions are indices of relative capillary anoxemia, then it can be postulated that the schizophrenic will spend more of his life in an anoxemic state than any of the other five psychiatric conditions with which he is compared. If the schizophrenic, by amplitude analysis, is also running at only borderline normal values or less at the peaks of his sine wave cycles, then the anoxemic situation can thereby be only further worsened. Amplitude analysis has not yet been carried out on the present protocols but the nonkinetic observation of schizophrenic patients by similar monitors (*e.g.*, **13**) confirms such capillary anoxemia in them at rest. And of course the tissue anoxia revealed by the "ground substance" changes is the ultimate indicator of the results of this capillary anoxemia.

If frequency analysis of spontaneous endogenous autonomic oscillations can in truth lead to the differentiation of schizophrenia from other varieties of psychiatric disturbance and indeed from mental health, then some work concerning the site or source of a pacemaker is in order. In the thirties several workers (*e.g.*, Dusser de Barenne; Dempsey and Morison) had reported evidence suggesting that the thalamus enjoyed the role of pacemaker for cortical electrical rhythms. Later the hypothalamus came to be preferred (through the influence of Cobb, Le Gros Clark and others) to the extent that Gellhorn (18) was able to write in 1953 that we reach "*per exclusionem* the hypothalamus as the structure in which functional reactivity seems to be altered" in the functional psychoses—including schizophrenia. Today, with the identification of "non-specific" neural mechanisms, Magoun (25) speaks of the "paleocortical hippocampus which, with its basal ganglion, the amygdala, served as the highest forebrain mechanism regulating subcortical function." Even before Magoun's (25) detailed analysis, Allen (1) had given an accurate description of the reticular formation which serves even when but "little differentiated in the lower vertebrates" as "an effective mechanism which enables these animals to adapt themselves properly to their various inside and outside conditions." Jasper (21), who rediscovered this notable contribution of Allen's (1), notes that he predicted that considerable portions of the *formatio reticularis* function as efferent centers for tonic impulses. And the system is "non-specific" because it can be defined "in a general way" as "extending from the thalamus down into the medulla, (and) is represented by all those neuronal structures, which are not included in the specific afferent pathways ' (21). To the reticular or non-specific system have been ascribed some of the functions most explicitly disorganized in mental illness: arousal, attention, conation, wakefulness; (*c.f.* Jung's (22) allusion to the schizophrenic as "a dreamer in an awake world" and Hoskins' (20) similar conclusions; also Doust's (14) findings of conative impairment in all psychiatric syndromes); the higher level of integration of the autonomic nervous system (*c.f.* the chaotic and later barren affect in schizophrenia; the excessive autonomic lability of schizophrenics and other psychiatric patients; perceptual disturbances and distortions); and as a pacemaking, regulating, integrating mechanism for spontaneous endogenous cycles of autonomic and metabolic activity, of which our present findings are an example.

SUMMARY

Continuous longitudinal observations were made on 182 resting psychiatric patients with schizophrenia, organic brain disease, manic-depressive psychosis, involutional melancholia, epilepsy, psychoneurosis and psychopathy. Monitoring techniques included measurement of skin temperature, capillary blood pressure, capillary blood-oxygen saturation, capillary blood flow, alveolar pCO_2, and the *in vivo* observation of changes in the intercapillary "ground substance" of the nailfold skin.

It was found that each of these monitors of autonomic and metabolic activity showed spontaneous oscillations of a regularly periodic sine-wave cyclic type in the resting unstimulated subject.

Frequency analysis of these spontaneous periodicities showed their means to lie within the recurrence range of 2.5 to 11 minutes. Analyses of co-variance and an exemplary sample multivariance analysis proved that, by contrast with the practically insignificant variables of age, sex and duration of illness, psychiatric diagnosis was outstanding in differentiating between the group mean frequencies. The longest cycles were found in patients with schizophrenia; the shortest in patients with epilepsy. Patients with organic brain disease had oscillations whose periodicity was slightly but significantly longer than those with epilepsy, while patients with manic-depressive psychosis, involutional melancholia, minor disorders (and the mentally healthy) lay between the organic patients and the schizophrenics.

The literature on spontaneous endogenous activity is subjected to brief review and the relationship of these autonomic and metabolic oscillations to properties of the reticular activating system and to mental illness (and especially schizophrenia) is discussed.

REFERENCES

1. Allen, W. F. Formatio reticularis and reticulospinal tracts, their visceral functions and possible relationship to tonicity and clonic contractions. J. Washington Acad. Sci., **22:** 490–495, 1932.
2. Benitez, H. H., Murray, M. R. and Woolley, D. W. Effects of serotinin and certain of its antagonists upon oligodendroglia cells in vitro. In *Proc. 2nd Int. Cong. Neuropath.*, Part 2, pp. 423–428. Excerpta Medica, Amsterdam, 1955.
3. Bünning, E. Endogenous diurnal cycles of activity in plants. In *Rhythmic and Synthetic Processes in Growth*, Chap. 6. Princeton Univ. Pr., Princeton, N. J., 1957.
4. Bünning, E. Endogenous rhythms in plants. Ann. Rev. Plant. Physiol., **7:** 71–90, 1956.
5. Burch, G. E., Cohn, A. E. and Neuman, C. A study by quantitative methods of spontaneous variations in volume of the finger tip, toe tip and postero-superior portion of the pinna of resting normal white adults. Amer. J. Physiol., **136:** 433–447, 1942.
6. Chambers, R. and Zweifach, B. S. Topography and function of the mesenteric capillary circulation. Amer. J. Anat., **75:** 173–205, 1944.
7. Doust, J. W. L. The capillary system in patients with psychiatric disorders: Increased capillary blood pressures in neurosis and psychosis and its relation to some correlates of anoxaemia. A. M. A. Arch. Neurol. Psychiat., **74:** 137–143, 1955.
8. Doust, J. W. L. The capillary system in patients with psychiatric disorder: The ontogenetic structural determination of the nailfold capillaries as observed by photomicroscopy. J. Nerv. Ment. Dis., **121:** 516–526, 1955.
9. Doust, J. W. L. Recent investigations in selected aspects of the physiological dimensions, and the implication for prevention. In *Preventive Psychiatry: Proceedings of the 2nd Institute*. Univ. of Iowa Pr., Iowa, 1959.
10. Doust, J. W. L. Spectroscopic and photoelectric oximetry in schizophrenia and other psychiatric states. J. Ment. Sci., **98:** 143–160, 1952.
11. Doust, J. W. L. Studies on the physiology of awareness: Oximetric evidence of the role of anoxia in certain psychiatric states. Proc. Roy. Soc. Med., **44:** 347–352, 1951.
12. Doust, J. W. L. and Callagan, J. E. Studies on the physiology of awareness: Metabolic concomitants of the perception of colour. Confin. Neurol., **15:** 298–303, 1955.
13. Doust, J. W. L. and Coleman, L. I. M. Studies on the physiology of awareness: Conative insufficiency in psychiatric patients. Canad. Psychiat. Ass. J., **1:** 144–148, 1956.
14. Doust, J. W. L. and Melville, P. M. Capillary blood flow in psychiatric patients and its modification by stress. Canad. Med. Ass. J., **75:** 742–746, 1956.
15. Doust, J. W. L. and Salna, M. E. A stroboscopic method for estimating capillary blood flow in the skin of man. J. Nerv. Ment. Dis., **121:** 511–515, 1955.
16. Gastaut, H. The brainstem and cerebral electrogenesis in relation to consciousness. In *Brain Mechanisms and Consciousness*, pp. 249–282. Thomas, Springfield, Ill., 1954.
17. Geiger, R. S. Subcultures of adult mammalian brain cortex in vitro. Exp. Cell. Res., **14:** 541–566, 1958.
18. Gellhorn, E. *Physiological Foundations of Neurology and Psychiatry*. Univ. Minnesota Pr., Minneapolis, 1953.
19. Granit, R. *Receptors, and Sensory Perception*, Chap. 3, pp. 81–112. Yale Univ. Pr., New Haven, 1955.
20. Hoskins, R. G. *The Biology of Schizophrenia*, p. 191. Chapman & Hall, London, 1946.
21. Jasper, H. Reticular-cortical systems and theories of the integrative action of the brain. In *Biological and Biochemical Bases of Behavior*, Harlow, H. F. and Woolley, L. N., eds., pp. 37–61. Univ. Wisconsin Pr., Madison, 1958.
22. Jung, C. G. *Psychology of Dementia Praecox*. Nerv. & Ment. Dis. Monographs, New York, 1909.
23. Kuno, Y. *The Physiology of Human Perspiration*. Churchill, London, 1934.
24. Lacey, J. I. and Lacey, B. C. Relationship of resting autonomic activity to motor impulsivity. Proc. Ass. Nerv. Ment. Dis., **36:** 144–209, 1958.
25. Magoun, H. W. Non-specific brain mechanisms. In *Biological and Biochemical Bases of Behavior*, Harlow, H. G. and Woolley, L. N., eds., pp. 25–36. Univ. Wisconsin Pr., Madison, 1958.
26. Malamud, W. and Sands, S. L. A revision of the psychiatric rating scale. Amer. J. Psychiat., **104:** 231, 1947.
27. Müller, O. *Die feinsten Blutgefässe des Menschen in gesunden und kranken Tagen*, Vol. 2. Enke, Stuttgart, 1939.
28. Pittendrigh, C. S. and Bruce, V. G. Oscillator model for biological clocks. In *Rhythmic and Synthetic Processes in Growth*, Chap. 5. Princeton Univ. Pr., Princeton, 1957.
29. Pomerat, C. M. Pulsatile activity of cells from the human brain in tissue culture. J. Nerv. Ment. Dis., **114:** 430–449, 1951.
30. Thomae, H. *Die Periodik im kindlichen Verhalten*, p. 154. Verlag für Psychologie, Göttingen, 1956.
31. Zijlstra, W. G. *Fundamentals and Applications of Clinical Oximetry*, 2nd ed. Van Gorcum, Assen, Holland, 1953.
32. Zinn, J. G. Von dem Schlafe der Pflanzen. Hamburg Magazin, **22:** 40–50, 1759.

THE EFFECTS OF TEMPERATURE ON NERVE EXCITABILITY, ATTENTION AND REACTION TIME IN CHRONIC SCHIZOPHRENIA[1]

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Application of hydrotherapy in mental hospitals has become an integral part of the physical medicine programs with various types of psychiatric disorders. Traditionally, hydrotherapy has been used in the treatment of mental illness to produce "stimulant" effect with colder temperatures (±5, 70° F.) and "sedative" effect with higher temperatures (±10, 100° F.). Very little information is available on relationship of temperatures used in hydrotherapy to psychomotor variables, such as preparatory set and attention of schizophrenic patients. The authors assume that the effects of thermal sensitivity are not limited to physiological factors, but may be related to general behavioral adjustments and human motivation. Therefore, it is important to determine how temperature may enhance the amenability of psychiatric patients for other types of therapeutic programs. This study was designed to determine the relationship of water temperature to nerve excitability as measured by chronaxy, continuous performance test (CPT), and reaction time (RT) in chronic, undifferentiated schizophrenic patients. Although, in this study, the above measures were used as minute samples of behavior, it can be safely assumed that they are all related to neurologic function which, in turn, affects the patient's "readiness" to respond to his environment (*i.e.*, affect his "attention" to any particular stimulus which may impinge upon him).

The conditions used in this experiment required learning responses associated with the CPT and RT tests, as well as measuring involuntary responses with chronaxy. Both types of responses are *effector* responses and should have a significant relationship to water temperatures as may be applied in treatment programs.

In the quantitative assessment of neuromuscular excitability, two factors are of paramount importance: 1) the strength of the stimulus required to produce excitation, and 2) the duration of the stimulus. The threshold response, or rheobase, is the minimal intensity of current of prolonged duration necessary to excite the tissue. It may be measured in volts or milliamperes. The chronaxy, on the other hand, is the minimal time required to excite the tissue with a stimulus of twice the strength of the rheobase. Harris (5) enumerated the factors or conditions which would influence the values of the rheobase and the chronaxy in normal subjects. He found that threshold values depend upon tissue excitability and skin resistance. The latter is considerably influenced by environmental conditions—particularly factors which alter skin circulation and temperature. According to Harris, the temperature is inversely proportional to skin resistance and, hence, to threshold values or rheobase, *i.e.*, a rise in temperature will produce a fall in the rheobase, and a fall in skin temperature will produce a rise in the rheobase.

It was emphasized by Rosvold, Mirsky, Sarason, Bransome and Beck (12) that the advantages of CPT lie in that a patient is unable to choose his own time in responding or delaying his response when there are temporary lapses in attention. Electroencephalographic evidence suggests that brain-damaged individuals show inferior ability in tasks requiring continuous attention or alertness (9, 14). This was usually revealed by hypersynchronous activity in EEG, which was representative of momentary lapses in attention. Even though the present sample of patients did not include any brain-damage cases, it was hypothesized that continuous withdrawal and development of chronic, schizophrenic behavior patterns should indirectly affect the patient's general motivation level and his alertness to his environment. Consequently, the CPT was used in this study because it requires continuous attention over an interval of time and provides tasks which vary in complexity, and thus demand different levels of attention.

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It was found that both the organic and schizophrenic patients show retardation in RT (3, 7) and that motivational factors are more likely to be involved in influencing schizophrenics' performance on such tasks. This finding was supported by Rosenbaum, Mackavey and Grisell (11). A number of studies have also indicated that schizophrenics are slower and encounter difficulty in maintaining preparatory set required in RT (12). Although it has also been suggested that some biological deficit is present in reaction of schizophrenic patients (3), the major assumption of the study is that RT is measure of preparedness or set to respond to the environment.

METHOD

The subjects (*Ss*) were 40 chronic, undifferentiated schizophrenic patients in a large, 1176-bed Veterans Administration NP hospital. These patients were randomly divided into two temperature groups (72° F. and 100° F.) and were matched for age and length of institutionalization. The means for age and length of institutionalization for the 72° and 100° groups were 37.8 and 8.2, and 37.6 and 8.8, respectively. All patients were being treated with either trifluoperazine (10 or 20 mg.) or prochlorperazine (30 or 60 mg.). There was an equal number of patients treated by each drug in each of the two temperature conditions.

Chronaxy. The temperature treatment conditions of 72° F. and 100° F. were accomplished by immersion of patients in a whirlpool with water level reaching the axillae. The duration of immersion for both temperature groups was 15 min. Chronaxy readings were taken immediately before and after the immersion. The area tested for chronaxy was the middle fibers of the deltoid muscle and there was no direct application of water to the immediate area being tested. A light was focused on the area of the deltoid muscle for more accurate observation of response. Standard procedure was used in chronaxy by finding the motor point with galvanic current, by obtaining minimal contraction after location of the motor point, finding the rheobase, doubling the rheobase, and increasing duration of the current to obtain a minimal contraction. More detailed discussion of this procedure is provided by Bowman and Schaefer (4). Upon determination of chronaxy, the *S* was taken to an adjoining area for the CPT and RT tests. Approximately, a 2 to 3 min. lapse existed between the chronaxy and the final two tests.

CPT. The CPT apparatus was essentially the same as it was described in more detail by Rosvold *et al.* (12). There were two series of letters, 36 each, mounted on a revolving copper drum. The drum was energized by an "Erector" electric motor powered by 110 volts AC. There were two tasks, X and AX, respectively. The drum revolved two revolutions per minute and was enclosed in a wooden case. The *S*'s task (X or AX) was determined by changing the horizontal position of the slot. On the experimenter's side of the apparatus were two automatic counters which registered the

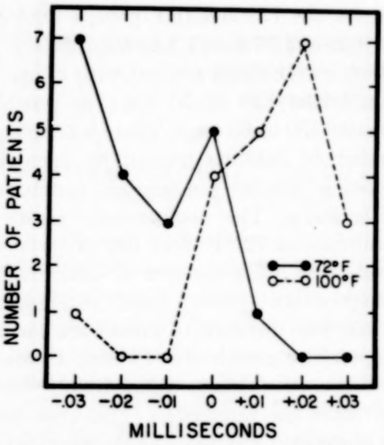

FIG. 1. Direction and magnitude of differences between pre- and post-immersion chronaxy measures for 72° and 100° F. temperatures.

right and the wrong responses. The letters were illuminated by two 0.8 watt lamp bulbs mounted inside the case, one above each series of letters. The *S* was to depress a telegraph-type response key placed directly in front of the apparatus. The letters were visible for approximately 1 sec. intervals. A correct response was recorded if the key was depressed within 0.76 sec. of exposure of the correct letter. Following the exposure of the letter, there was approximately 0.31 sec. before the next letter appeared. The X task was presented first. All *S*s were given a practice period for the duration of one drum revolution. They were instructed to depress the response key every time letter X appeared in the slot and were given this task for a 5 min. period. Following the 2 min. rest period, they were presented with a more complex, AX task, also for a 5 min. period; this required response to letter X, only when it followed letter A. There were 10 and 6 correct responses per revolution possible for X and AX tasks, respectively. The total score was based on a number of correct responses produced in each task. The typical instructions varied somewhat from subject to subject in order to insure complete understanding of the problem.

RT. The RT apparatus consisted of a response key, a buzzer, and an electric reaction timer calibrated in units of .01 sec. All *S*s were given five practice trials on their preferred hand. They were instructed that when the signal "ready" was verbally given by the experimenter, they were to depress the response key. After a 3, 4, 5, or 6 sec. interval, a buzzer was energized. The *S*s were told to release the key as quickly as possible after they heard a buzzer. Automatically, the buzzer and the timer were terminated with *S*'s release of the key. The duration of time between the onset of the buzzer and release of the key was reported as RT in units of .01 sec. The 3, 4, 5, and 6 sec. delays were randomly distributed over 20 trials to preclude anticipation of a signal. The *S* responded with right hand first for 20 trials; followed by a 2 min. rest period, and the left hand RT task also for 20 trials. The RTs were recorded by the experimenter after each trial. Experimental room temperature was held constant at 76° F. for both the CPT and the RT tasks.

RESULTS

The pre- and post-immersion chronaxy was ascertained for both temperature groups. The sign test (13) was performed in both instances on the basis of one-tail probability, since it was hypothesized that the chronaxy in the 100° group would increase, while in the 72° group it would decrease. Figure 1 represents the difference between pre- and post-immersion chronaxy measures for both temperature groups. The analysis of the chronaxy data, as indicated by the use of binomial test (13), reveals significant increase in chronaxy for the 100° group ($p < .001$) while a significant decrease in the 72° group ($p < .001$) was found. This supported the original assumption that lower temperature would increase the excitatory potential of nerve tissue.

The means, standard deviations, and the difference scores on the CPT are presented in Table 1. These scores are for both the X and AX tasks for the 72° and 100° temperature groups. The differences between the two temperature groups on both the X and AX conditions were highly significant ($t = 3.08$, $p < .01$, and $t = 3.41$, $p < .01$, respectively). Since the number of possible correct responses on the AX condition was less than that available on the X condition, the adjusted AX scores were obtained through multiplication by a constant (1.67) in order to achieve comparable mean scores. It was found that the AX task was significantly more difficult than the X task for both the 72° ($t = 2.86$, $p < .01$) and the 100° ($t = 3.01$, $p < .01$) groups. The mean X scores and the adjusted AX scores are represented in Figure 2. This figure emphasizes the differential between the two tasks as well as the two temperature groups. The difference between the mean differences of the two groups was computed with the result that under higher water temperature (100° F.) the difference between the X and AX task was significantly greater than that between the X and AX performance of the 72° group ($p < .02$).

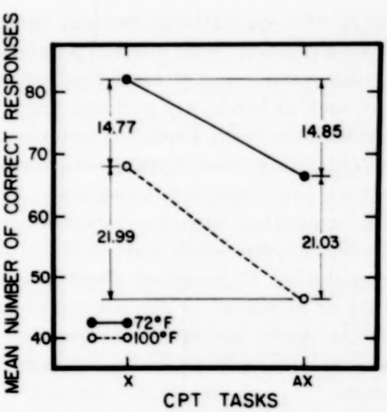

FIG. 2. Mean number of correct responses on the CPT as a function of temperature conditions. The AX mean scores are adjusted.

The RT scores and variances for the two temperature groups are represented in Table 2. Analysis of the data indicated that although the mean reaction time for the 72° group was lower than that of the 100° group, the differential performance was not as significant as it was with the CPT, even though some trend of significance is indicated ($p < .10$). It is noteworthy that the variability of the 100° group was greater than that of the 72° group, indicating a wider range of temperature effects under the 100° condition. The Spearman rank correlation coefficient was computed for both temperature groups to ascertain the relationship between performances on the CPT and the Rt tasks. The r_s between CPT and RT for the 72° group was .68 ($p < .01$) and the r_s for the 100° group was .72 ($p < .01$). Thus, it was indicated that there is a significant positive relationship between the CPT and the RT performances under both temperature conditions.

TABLE 1

Means and Standard Deviations for Performance on the CPT under Two Temperature Conditions

Task	72°		100°		Diff.	*t*	*p*
	Mean	S.D.	Mean	S.D.			
X	82.90	5.30	68.83	18.40	14.07	3.08	<.01
AX	40.75	7.71	28.05	13.90	12.70	3.41	<.01

TABLE 2

Means and Standard Deviations for RT Performance under Two Temperature Conditions

Task	72°		100°		Diff.	*t*	*p*
	Mean	S.D.	Mean	S.D.			
RT	35.63	23.70	52.18	41.12	16.55	1.49	<.10

DISCUSSION

It is generally accepted that the physical property of water temperature renders it capable of producing certain conditions affecting mental patients. The studies of work capacity and fatigue, as well as body strength, have indicated that for short durations cold applications have increased the work output and muscular work (8). Wright (16) has proposed that the skin areas are, through the sympathetic nervous system, "in reflex relation" with internal organs and vascular system, and stressed that external areas, such as hands, are in direct reflex relation with the brain. From this formulation, it would follow that certain temperatures affect the brain function through this direct reflex connection with the external areas. The results of this study show that not only the excitation of receptors alone but also the set or attention, as defined, which controls the speed, strength, and duration of response were influenced by temperature changes.

In the main, one of the purposes of this experiment was an attempt to determine the differential effect of water temperature levels on psychomotor activity and general alertness. The results show that local excitability of a particular muscle is related to the overall, systemic excitability of an organism, and that higher temperatures (100° F.) inhibit the degree of alertness and attention in chronic schizophrenics as compared with lower temperatures (72° F.). If one assumes that alertness and motivation may be treated identically, as suggested by Hebb (6), it can be postulated that the immediate motivational factors could be influenced by systematic and constant exposure to lower temperatures. The present results indicate greater influence of temperature on the CPT task of higher complexity—where the *Ss* were required to respond to letter X only when it followed letter A, as compared to the simpler task X (Figure 2). It would be interesting to pursue this further in even more complex conceptual and problem-solving tasks and social adjustment. It is plausible that response to a psychiatric treatment program and changes in social adjustment may be influenced by environmental temperature, although this postulated relationship remains to be evaluated. The present experiment deals only with the immediate effect of a 15-minute exposure to temperature changes. It would be important to investigate the long-term effects as well as rate of adaptation to constant, environmental temperature levels. One may find that the present results are due to *changes* in temperature rather than long-term exposure where habituation may take place.

Frequent clinical comment is made to the effect that psychological test results of emotionally disturbed patients frequently underrate their capacities. One way of overcoming this problem and obtaining what might be assumed to be a more adequate measure would be to subject patients to periods of cold stimulation prior to testing, which this study suggests increases their alertness and attention to punctate tasks. From results reported in this paper, one would likely find it necessary to restrict himself to relatively short periods of testing following temperature stimulation.

It is noteworthy that not only clinical factors, personality traits, and demographic variables (10), but also certain constituents of physical environment, such as temperature, may be essential in the treatment of schizophrenics. In the main, the deterioration of "interpersonal" abilities of schizophrenics has been stressed (1, 15). This study attempts to point out the importance of physical environmental factors in overall functioning of schizophrenic patients. Those familiar with institutional settings have frequently detected overheated dayrooms and dormitories. The results of this study suggest that this circumstance could conceivably contribute to the apparent lethargy of patients in such settings. The experimental manipulation of temperature as an additional modality for short-term treatment effects should be investigated. In agreement with Hebb's formulations (6), the present findings indicate that the "enduring selectivity" of neural function by sequential firing of cell assemblies is facilitated, at least temporarily, by lower temperatures, and enhances attention. Since, according to Hebb, sensory events such as influenced by lower temperatures are capable of influencing central action, it is implied that generalized sensitization of schizophrenic patients may be accomplished with lower temperatures. Whether the changes of temperature are more influential in schizophrenics than in normals has not been clearly determined. However, there is some suggestion that more disturbed individuals respond more radically to temperature differences than the normals (2). Further studies will be necessary to ascertain the relative effects of temperature on constituents of physical environment in which a treatment program is carried out.

SUMMARY

The primary aim of this study was to determine the relationship of two levels of water temperature (72° F. and 100° F.), to measures of nerve excitability, CPT and RT, with 40 chronic, undifferentiated schizophrenic patients. The major findings were: 1) Thresholds of nerve excitability were significantly decreased and increased under 72° F. and 100° F. conditions, respectively. 2) Span of attention, as measured by CPT procedure, was a significant function of two temperature levels with inhibited performance resulting from higher temperature. 3) Significant interaction between two degrees of difficulty and two temperature conditions was found where higher temperatures had a significantly greater inhibiting effect on more difficult tasks. 4) RT was slower under higher temperatures although not as significantly as in the case of CPT. 5) Significant correlation was indicated between RT and CPT performances.

The results were interpreted that the two levels of temperature have a significant, differential effect on nerve excitability, attention, and preparatory set. The findings also indicated the usefulness of the three measures in the assessment of general "alertness" in schizophrenic patients. Implications for variations in temperature as an additional treatment modality in psychiatric setting were suggested.

REFERENCES

1. Affleck, D. C. The effects of interpersonal situations on conceptual performance in schizophrenia. Dissert. Abstr., **14:** no. 2399, 1954.
2. Bellak, L. *Schizophrenia*, p. 32. Logos, New York, 1958.
3. Benton, A. L., Jentsch, R. C. and Wahler, H. J. Simple and choice reaction times in schizophrenia. A. M. A. Arch. Neurol. Psychiat., **81:** 373–376, 1959.
4. Bouman, H. D. and Shaffer, K. J. Physiological basis of electrical stimulation of human muscle and its clinical application. Phys. Ther. Rev., **37:** 207–223, 1957.
5. Harris, R. Variations in strength duration curves and excitability indices in normal subjects. Ann. Phys. Med., **1:** 126–133, 1952.
6. Hebb, D. O. *The Organization of Behavior*. Wiley, New York, 1949.
7. Huston, P. E., Shakow, D. and Riggs, L. A. Studies of motor function in schizophrenia: Reaction time. J. Gen. Psychol., **16:** 39–82, 1937.
8. Kellogg, J. H. In *Rational Hydrotherapy*, Davis, F. A., ed., Vol. **4**, pp. 95–140. Philadelphia, 1910.
9. Lindsley, D. B. Electroencephalography. In *Personality and the Behavior Disorders*, Hunt, J. M., ed., pp. 1033–1103. Ronald, New York, 1944.
10. Pishkin, V. and Bradshaw, F. J., Jr. Prediction of response to trial visit in a neuropsychiatric population. J. Clin. Psychol., **16:** 85–88, 1960.
11. Rosenbaum, G., Mackavey, W. R. and Grisell, J. L. Effects of biological and social motivation on schizophrenic reaction time. J. Abnorm. Soc. Psychol. In press.
12. Rosvold, H. E., Mirsky, A. F., Sarason, I., Bransome, E. D., Jr. and Beck, L. H. A continuous performance test of brain damage. J. Consult. Psychol., **20:** 343–350, 1956.
13. Siegel, S. *Nonparametric Statistics*. McGraw-Hill, New York, 1956.
14. Schwab, R. S. *Electroencephalography in Clinical Practice*. Saunders, Philadelphia, 1951.
15. Whiteman, M. The performance of schizophrenics on social concepts. J. Abnorm. Soc. Psychol., **49:** 266–271, 1954.
16. Wright, R. *Hydrotherapy in Hospitals for Mental Diseases*. Tudor Press, Boston, 1932.

METHODOLOGICAL CONSIDERATIONS IN THE QUEST FOR A PHYSICAL BASIS OF SCHIZOPHRENIA[1]

ROY B. MEFFERD, Jr., PhD.,[2] LOUIS J. MORAN, PhD.,[2] and
JAMES P. KIMBLE, Jr., M.A.[2]

In a search for characteristic physical differences groups of schizophrenic patients have been compared with groups of nonschizophrenics in many hundreds of experiments. These studies have failed to establish a single physical characteristic unique to schizophrenia (*e.g.,* see **2**). An important reservation must be made concerning these experiments. The experimental procedure of comparing *groups* of schizophrenics with *groups* of nonschizophrenics by its nature precludes the discovery of certain types of relationships. We propose to demonstrate that certain significant psychophysiological relationships can be discovered in longitudinal studies which cannot, *in principle,* be established in classical cross-sectional or prê-post experiments.

Plant (10), four decades ago, made a compelling case for the "return" of research emphasis in psychiatry to longitudinal studies of the individual patient: "One searches psychiatric literature in vain for any other concept than that dementia praecox patients always remain the same ... It is true that a patient who is dementia praecox holds that diagnosis a year from now just as truly as to-day, but I hold it is fundamental that that patient is a different personality to-day than she will be one week from now. To make a blood examination once, or—as some very daring experimenters have done—even three or four times, to make a mental examination once, or make a neurological examination once, and to consider that these results picture the patients seems to me to be fundamentally fallacious ... the patient's condition to-day is of no interest nor is his condition one month from now of any interest—the only matter of interest being the *relation* of the condition to-day to that of one month from now. This seems a simple philosophical concept and yet the literature is full of 'blood pressure of 100 manics as compared with 100 dementia praecox'... They are 'cross-section' studies, whereas I am making an appeal for 'long-section' studies on psychiatric patients. If we are to know the patient, or indeed any person—because this problem is really the problem of the character of life—we must compare the patient with himself and not with any other patient" (10, p. 561).

It is true that there are many case-history and similar reports in the literature where repeated measurements were made on the same subjects, but a typical case history does not incorporate the rigor, objectivity, precision of procedures, and controlled experimental design of a definitive scientific study. Obviously, in a longitudinal experiment, it is as important to meet the usual

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[1] This methodological concept was presented in detail at the American Psychological Association Symposium on Multivariate Analysis of Repeated Measurements on the Same Individual, September, 1958. The experimental work presented here was initiated in January, 1958, while the authors were at The University of Texas (the Clayton Foundation Biochemical Institute, Psychology and Philosophy Departments, respectively) and was supported by grants-in-aid from the Welch Foundation, Houston, Texas, and the Hogg Foundation for Mental Health, The University of Texas. Other aspects of this work have been published elsewhere (5, 7, 8). Grateful acknowledgement is made for the assistance given by the staff of the Waco V. A. Hospital and especially by Drs. Wealthy W. Good and Donald R. Gorham, and Mr. Stanley Tarnowski, and to Dr. Alex D. Pokorny, of the Houston V. A. Hospital for calling the Plant (7) reference to our attention. Dr. Louis J. Moran is on leave of absence from the Psychology Department of the University of Texas.

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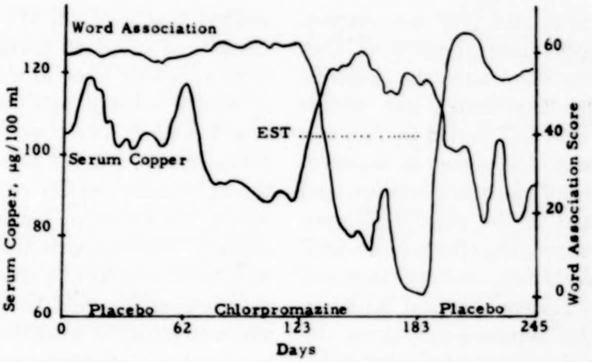

FIG. 1. Changes in fasting serum copper levels and psychiatric condition of a male schizophrenic (10-day moving average).

criteria of experimental precision as it is in a cross-sectional experiment.

As an example of the yield from a longitudinal experiment, we will discuss the relationship between two variables of current interest in psychiatry—change in psychiatric condition and serum copper levels. A 31-year-old Caucasian male chronic schizophrenic patient was studied for 246 consecutive days from the start of his first hospitalization. Psychiatric condition was evaluated by (a) a special 20-item Word Association test with 30-alternate forms administered daily (scored both for "complex indicators" (11) and "relatedness" of associations (6)), and (b) estimates of daily changes in the "degree of illness" made independently by the attending psychiatrist, clinical psychologist, and other clinical personnel. Of these criteria of psychiatric condition, only the relatedness scores on word association are presented in Figure 1, since all these measures were highly intercorrelated (r's = .89 to .93). In this figure, the higher the patient's "relatedness" score, the better his mental condition.

Serum copper was determined (9) on early morning fasting blood samples (10 ml) taken on alternate days two hours before the word association test was administered. The experiment was divided into four treatment periods as follows: 62 days, no treatment (placebo); 60 days, chlorpromazine (400 mg/day); 60 days, chlorpromazine plus 20 electroshock treatments (EST); and 64 days, no treatment (placebo). The patient had no infections or other conditions that are known to alter copper metabolism (4) and he did not vary widely in physical activity. A 7-day diet balanced to maintain body weight and copper intake was used.

In the initial and final periods (placebo) serum copper levels and psychiatric condition were not significantly correlated. In these periods both sharp (1–2 days) and prolonged (up to 10 days) elevations or drops occurred in the serum copper level, that were not accompanied by detectable changes in psychiatric condition. However, during the 121 days the patient was receiving chlorpromazine, there were clear and definite concomitant inverse changes ($r = -.72$) in both variables, as can be seen in Figure 1. That this was not due entirely to gross treatment effects (*i.e.*, the major shifts in mean levels) is evidenced by the fact that a significant correlation remained after these effects were partialled out statistically ($r = -.47$).

A few days after chlorpromazine therapy was started the serum copper level abruptly dropped and this drop was accompanied by a slight though statistically significant improvement in mental condition ($p \leq .01$, as determined both by parametric and nonparametric statistical tests). Thereafter, the serum copper level decreased at a slower though steady rate until EST was started. Then serum copper rose abruptly to high levels, and a few days later the patient's mental condition deteriorated just as abruptly. During this EST period there was a brief but unmistakable period of improvement in the patient's mental condition, and this was reflected in the slightly delayed drop in serum copper. The effects of the EST persisted for several days after the last treatment. Then the patient's mental condition improved and his serum copper level decreased steadily to a final level comparable with that seen just preceding the EST. This effect (residual chlorpromazine?) persisted in both variables for about 30 days after the drug was last administered. Thereafter the patient's mental condition deteriorated and his serum copper started again to fluctuate in a manner unrelated to his word association scores.

Of considerable interest was the fact that within the separate therapy periods (*i.e.*, the 121 days of chlorpromazine or chlorpromazine and EST) the day-to-day variability in serum copper was markedly reduced ($p < .01$ (1)). This, together with the consistent correlations found during these periods, suggests that serum copper had some relationship to psychiatric condition that became evident as a result of the chlorpromazine-induced changes. They suggest further that the chlorpromazine effect was cumulative and that it eventually triggered some mechanism that influenced both variables.

The mean of this patient for serum copper during the first 73 days (before the chlorpromazine effect occurred) was 108.2 (S.D. 9.66) μg/100 ml. Even with the marked treatment effects that occurred, the serum copper mean for the entire 246 days was 104.3 (S.D. 14.3) μg/100 ml.

Two aspects of this study have important methodological implications. A comparison of the serum copper values of this schizophrenic with those reported for normal subjects (in which a comparable chemical method was used (3, 4)) reveals that the means and standard deviations of this patient were very close to those of the sample of normal subjects and that not one of his serum copper levels were outside of this normal range. Yet, the patient was psychotic throughout the 246 day period (although, of course, his degree of illness changed). Specifically, this comparison demonstrates that within the context of a cross-sectional study no relationship could have been found between psychiatric condition and serum copper for this patient. Suppose, in an imaginary cross-sectional study, that this patient had been a member of a group of schizophrenics (receiving chlorpromazine) being compared to a group of normal subjects. On the basis of various measures of his psychiatric condition, we would judge that the patient is correctly assigned to the schizophrenic group. Yet, on the basis of the measurement of his serum copper, we would judge that his serum copper value is not deviant from those of the normal sample. That is, we would judge that, for this patient, there is no relation between psychiatric condition and serum copper. However, the conclusion which we must draw here is that in this patient there was a relation between psychiatric condition and serum copper, but that a cross-sectional experiment would have precluded its discovery. More broadly, this implies that a search in schizophrenics for values abnormal with respect to population norms is perhaps futile, since it could be changes about an individual's own optimal level that are deleterious.

It might be argued that one can obviate the above criticism of the cross-sectional technique by employing a pre-post experimental design. Indeed the pre-post design does, in part, avoid this difficulty since each subject is compared with himself. Much of this advantage is promptly lost, however, for typically these individual values are averaged in the same way as in cross-sectional studies. Another major difficulty in the pre-post design lies in the determination of the "correct" time interval between the "pre" and the "post" measurements. In view of the extreme variability of individuals across time, this problem is crucial. In our subject both his psychiatric condition and serum copper manifest extreme variation across time. If this subject had been used in a pre-post experiment, we would have drawn arbitrary and different conclusions concerning changes in these variables depending upon the arbitrary and different times at which the "pre" and "post" measurements were made.

Of course, our results do not establish a functional relationship between serum copper levels and psychiatric condition. However, they do show, in a striking fashion, that subtle but significant concomitant changes can take place in psychological and physiological processes that would have been overlooked entirely in a cross-sectional or pre-post experiment.

The careful analysis of intra-individual variability in longitudinal studies permits the discernment of subtle psychophysiological relationships. This in turn increases the probability of implicating a functional relationship of etiological significance for schizophrenia. Knowledge of the specific physical mechanisms related to a psychosis in even *one* person would take us far beyond what is known today.

Since this report was submitted, Dr. J. B. Chassan has advanced a similar thesis on the unique power of the intensive study of an individual, from the viewpoint of a mathematical statistician (Psychiatry, **23:** 173–184, 1960).

REFERENCES

1. Hartley, H. O. Testing the homogeneity of a set of variances. Biometrika, **31:** 249-255, 1940.
2. Kety, S. S. Biochemical theories in schizophrenia. Science, **129:** 1528–1532 and 1590–1596, 1959.
3. Lahey, M. E., Gubler, C. J., Cartwright, G. E. and Wintrobe, M. M. Studies on copper metabolism. VI. Blood copper in normal human subjects. J. Clin. Invest., **32:** 322–328, 1953.
4. Markowitz, H., Gubler, C. J., Mahoney, J. P., Cartwright, G. E. and Wintrobe, M. M. Studies on copper metabolism. XIV. Copper, ceruloplasmin and oxidase activity in sera of normal human subjects, pregnant women, and patients with infection, hepatolenticular degeneration and the nephrotic syndrome. J. Clin. Invest., **34:** 1498–1508, 1955.
5. Mefferd, R. B., Jr., Moran, L. J. and Kimble, J. P., Jr. Functional systems analysis in psychopharmacological research. Trans. 4th Research Conference on Chemotherapy in Psychiatry, Veterans Administration, **4:** 133–134, 1960.
6. Moran, L. J. Vocabulary knowledge and usage among normal and schizophrenic subjects. Psychol. Monogr., **67:** 1–19, 1953.
7. Moran, L. J. and Mefferd, R. B., Jr. Repetitive psychometric measures. Psychol. Rep., **5:** 269–275, 1959.
8. Moran, L. J., Mefferd, R. B., Jr. and Kimble, J. P., Jr. Standardization of psychometric and psychodiagnostic tests for daily measurements in psychopharmacological research. Trans. 4th Research Conference on Chemotherapy in Psychiatry, Veterans Administration, **4:** 135–138, 1960.
9. Peterson, R. E. and Bollier, M. E. Spectrophotometric determination of serum copper with biscyclohexanoneoxalyldehydrazone. Anal. Chem., **27:** 1195–1197, 1955.
10. Plant, J. S. Rating scheme for conduct. Amer. J. Psychiat., **1:** 547–572, 1922.
11. Rapaport, D., Gill, M. and Schaefer, R. *Diagnostic Psychological Testing*, Vol. 2. Year Book, Chicago, 1946.

BOOK REVIEWS

Caudill, William. *The Psychiatric Hospital as a Small Society*. Harvard University Press, Cambridge, 1958. xxii + 406 pp., illus. $6.50

The book deals with observations, methods and conclusions derived from the author's open functioning as a research worker on the same small psychiatric unit (the Yale Psychiatric Institute) in which he had, more than a year before, posed successfully as a patient.

He obtained his data in three ways: from direct observations of patients on their wards; from attendance at clinical and administrative conferences; and from a projective device similar to the Thematic Apperception Test which he administered (as an opening to a focussed but flexible interview) to representatives of certain social groups in the hospital (patients, nurses, residents, senior clinical staff).

His work was done at a time when the wards were very different from what they soon became; so that, from the viewpoint of the faithfulness with which it describes those wards, it was out of date before the book was published, and partly because of its own effect upon the administrators of the hospital unit. Nevertheless much of what he observed and concluded has continued relevance to any psychiatric hospital and, with suitable modifications, to a variety of nonpsychiatric hierarchically structured task units as well.

The most striking impression from the materials presented in the book is that too exclusive preoccupation with the patient as a member of the dyad therapist-patient is more often than not insufficient either for adequate understanding of the patient or for favorable modification of his sick behavior. Viewing him, rather, as a member of a social system, with dependence upon numerous persons and upon material circumstances, proves surprisingly and refreshingly helpful with regard to both of these objectives.

Overemphasis of the role or of the habitual frame of reference or of the activity of any one of the groups upon whom a patient's condition and progress depend reduced the effectiveness of the unit as a whole: whether it was the senior physician's status, the few individual psychotherapeutic hours a week, the invariable psychoanalytic interpretation of a patient's behavior, or the role expectations of the nurses that was given undue weight. It was especially easy to underemphasize the great effect patients had upon each other, for the physicians paid little attention to it, and the nurses were inhibited in communicating to the doctors material outside the doctors' preferred psychoanalytic frame of reference. It was apparently evident in all its obviousness only to the social anthropologist who had eyes to look, ears to hear and no presuppositions to defend about who was most important for the patient. As a consequence, it was difficult to comprehend, prevent, or utilize therapeutically those collective disturbances (of which one is well described) which are repeatedly seen when such wards are studied closely, and of which at a given time the improvement or worsening of a considerable number of patients is clearly a reflection.

Such over- and under-emphases would be expected to yield to adequate communicative devices, but the administrative conferences (which did not include patients) were often ineffective even for those groups which participated. In part, this weakness was a function of the way such conferences were conducted (psychoanalytic in language, but too often authoritarian in manner); but also in part a function of the failure of all the groups involved to interact regularly with each other. A therapeutic community of the kind described by Maxwell Jones is clearly the solution for much of the difficulty here encountered.

The implications of giving adequate attention to each of the groups who interact with each other, and to the several frames of reference they habitually use, are far-reaching. More time would be spent by the nursing and medical staffs with the patients in groups—of conventional therapy-group size and of larger size—, more attention would be paid to the relationships among patients and of patients to individual staff members of all levels, of patients to members of their families, etc. This is not likely to happen, if overweening importance is ascribed to one segment of the hospital staff, or to the individual patient apart from his family, to individual psychoanalytic or psychotherapeutic hours, to electroshock therapy or to pharmacologic therapy. If the individual patient's welfare depends upon his functioning in the social unit of which he is a part while ill—as Caudill's and others' observations indicate forcibly—effective treatment requires that attention to the operation of the social unit be given its proper place. Nursing, medical and patient groups will be able to spend adequate time on this only by reducing the time now spent on other things, which range from the traditional nursing reports to the total number of individual psychotherapeutic hours.

Three minor points may be mentioned. Caudill's use of his "picture interview" demonstrates that significant uniformities about human behavior that are not otherwise apparent may be revealed when even relatively gross data are obtained in a somewhat standardized manner and are analyzed by simple numerical methods. His suggestion that social anthropologists who wish to study culture and personality should have psychoanalytic training (as distinct from training in observation, interviewing, group processes, etc.) must be weighed against his repeated demonstration that the thoroughly trained psychoanalysts who were the senior physicians in his study were narrower, not broader, in their viewpoint than he himself, and against the numerous indications that freely expressed diversity of frames of reference might have led sooner to the resolution of various difficulties on the wards he studied. Finally, his case for a strong regular collaboration (in teaching as well as in research) between a social anthropologist (or social psychologist or medical sociologist) and the staff of a psychiatric unit is well supported by the experience he reports.

The book is well written, has much of interest not mentioned in this review, and provides observations stimulating to the student of any task-oriented group which is hierarchically structured. Highly recommended.

George Saslow

Brody, Morris W. *Observations on "Direct Analysis"—The Therapeutic Technique of Dr. John N. Rosen.* Vantage Press, New York, 1959. 104 pp. $2.95

This small book is the first report of a project for the study of Dr. Rosen's "Direct Analysis" method of treating schizophrenic patients. Dr. Brody was the leader of a weekly three-hour session which followed a therapy session conducted by Dr. Rosen. These therapy sessions were observed by Dr. Brody, several assistant therapists (former patients), and visitors to the group. The five reports, by other authors, which are to follow will also have as their purpose the attempt to define and describe the theory and technique employed by Dr. Rosen.

Dr. Brody, a training psychoanalyst of the Philadelphia Psychoanalytic Institute presents sample transcriptions of the verbatim dialogue between Dr. Rosen and his patient, together with Dr. Brody's running commentary of his understanding of what Dr. Rosen was doing in these sessions. As effective as this method of presentation is, it remains clear from the author's comments that one must be in the presence of Dr. Rosen to receive the full emotional impact of the therapy session. Dr. Brody's description of Dr. Rosen, the patient, and the group immersed in the drama of "Direct Analysis" calls forth the picture of Charcot applying hypnosis at the Salpetriere.

Dr. Brody points out how Dr. Rosen attempts to break up the patient's previous identifications and bring about a new identification with the therapist. "To reinforce the patient's drive to identify with the therapist, the therapist must keep presenting himself as a successful, powerful figure of great authority." Dr. Brody is also of the opinion that direct interpretation of the Oedipal wish is "aimed at evoking guilt, not primarily aimed at giving insight." If the patient can be made to feel sufficiently guilty she will stop "acting crazy."

Some readers will be shocked by what Dr. Rosen tells his patients. This reviewer receives the impression that it is probably not the verbal content, but rather the emotional investment by the therapist which brings about the "cure." The next question that follows would be, "Does Dr. Rosen create a 'transference cure' "? After such a "cure," will subsequent therapy of the post-psychotic phase include an effective analysis of the transference? (That is to say, will the patient's "cure" withstand the working-through of transference analysis?) Unfortunately, these and many other questions are beyond the scope of this book.

The goal of such a project as a whole has much to recommend it. There is the possibility of gaining further understanding of psychotherapeutic processes in general, beyond the exploration of this technique alone. This would be especially likely if other therapists opened their work to similar scrutiny and publication.

Clarence G. Schulz

Lovell, K. *Educational Psychology and Children*. Philosophical library, New York, 1959. 272 pp. $6.00

From Professor Vernon's foreword to this book, one would gather that it had a strong British orientation. Vernon points out that the excellent fare, largely American, now available in England is expensive, unduly prolix, and not always pertinent to the vexatious problems of British schools. This text should provide a remedy: its cost should be moderate. Prolix it certainly is not, and it does devote considerable space to problems that have special significance for the United Kindgom. Some 6 of its 270 pages, for instance, are given over to the problem of selection for secondary schools and to the contentious matter of the 11+ examinations.

It is unfortunate, by the way, that Professor Vernon's foreword is not dated. Presumably it was written for the first edition. Otherwise by his claim that there are no useful British texts in this field he would seem to offer an unwarranted affront to such writers as Peel and Fleming.

To one familiar with American texts in this field, the brevity of the book is one of its striking features. How does Lovell do it? Not, primarily, by the omission of major areas. The twenty chapters cover the customary topics of human development; abilities and their measurement; and learning with its various facets. And not by a uniformly brief treatment of all topics. In dealing with abilities, educational measurement, statistics, and the measurement of personality, Lovell is quite explicit if not actually discursive. The forty-page section on the course of development is also treated in fairly leisurely fashion. Part of the condensation is attained by the frequent use of outlines or lists of points to be made. By and large, however, the brevity comes from the exceedingly sketchy treatment given to a few of the topics, especially those dealing with motivation, maturation, learning, and transfer. Some of these brief chapters, far from being compact outlines, almost suggest a collection of scattered comments. It is difficult to see, for instance, what a student would get from the section on theories of learning.

Along with this sketchy treatment of some topics, there is an occasional suggestion of a asual, almost haphazard approach. The inroduction, for instance, deals with the releance of educational psychology for teachers. In the middle of this topic we are precipiously introduced to a detailed discussion (four pages) of coefficients of correlation and the mechanism of heredity, seemingly coupled together. We return to a paragraph on the limitations of psychology, and then abruptly switch to a section on the number of chromosomes in man, with a warning that some of the material just read may need correction.

Apart from these occasional suggestions of the haphazard, the writing is clear, businesslike, and natural. The jarring notes, moreover, are largely restricted to the sections that are quite sketchy to begin with.

The strength of the book lies in the longer chapters dealing with abilities; measurement of intelligence, academic achievement, and personality; and in the discussions of general development through the school years. The treatment of Piaget's theories of concept development is exceptionally clear and reflects Professor Lovell's own work in this field.

The book contains an unusually informative and straightforward account of dullness and backwardness in children. This section is refreshingly free from sentiment or pleading. The chapter on personal development of children contains a succinct list of useful and shrewd suggestions. It also shows in some detail how personal adjustment is affected by the teacher, the motion pictures, and television.

Throughout, there is consistent evidence of shrewdness and caution. The teacher receives a realistic assessment of what he might expect from the group approach and from the activity movement. The student of development is warned of the complexities in the relation between parental behavior and personality problems in children. Professor Lovell is most insistent that we consider many hypotheses, including the hypothesis of heredity, before jumping to the conclusion that the parental treatment is the direct cause of the disorders in the child. To the worker in other fields, these sound and balanced treatments of development will more than make up for the slightness of the material on classroom learning.

J. M. Stephens

WALLIN, J. E. W. *Mental Deficiency: In Relation to Problems of Genesis, Social and Occupational Consequences, Utilization, Control and Prevention.* Journal of Clinical Psychology, Brandon, Vermont, 1959. xv + 200 pp. $5.00

According to the title page, Dr. Wallin has been a founder and one-time director of eight psychoeducational and mental hygiene clinics and six special education departments as well as a faculty member of 28 colleges and universities. The sincerity of his dedication to obtaining practical solutions of the important problems posed by mental deficiency for both society and the handicapped individuals themselves, is apparent throughout the book. After more than a half century of research, teaching, clinical practice and consultation, the author is, indeed, in an advantageous position to evaluate the current status of the field.

The aim of the present book is stated as an impartial presentation of evidence pro and con the basic social problems, associated with mental deficiency, still in need of a satisfactory solution.

Essentially, the book is concerned with the question of the role and the responsibility of society in the two broad areas of prevention and treatment. Specifically, the first three chapters cover various aspects of causation: 1) over-production of progeny by the mentally deficient and the lower socioeconomic groups; 2) relationship between mental deficiency and defective progeny; and 3) the relation of gene injury to mental deficiency.

The next two chapters deal with some of the indictments of problem behaviors which have been lodged against the mentally deficient group: criminality, sex delinquencies, alcoholism, and socio-occupational inefficiency. The final chapter presents a summary of ultimate aims of constructive work in the field.

In brief, the author indicates that knowledge is still far from complete in the areas of diagnosis, etiology, public education (including eradication of erroneous beliefs and prejudices), and effective methods of treatment and care.

The positive approach proposed by Dr. Wallin includes social control by means of sterilization, colonization, and proper prenatal care programs; effective treatment and care through: 1) early diagnosis and registration; 2) adequate medical care from the time of birth; 3) proper care, supervision, and control; and 4) special education to develop whatever potentials are present to the maximum.

As a result of the writer's effort to be unbiased and to present all important evidence, sections of the book are difficult to read and appear incompletely integrated. The main value of the work, as stated by the author himself, is as a reference book and conveniently comprehensive bibliography.

However, one is tempted to recommend that all professional workers in any of the disciplines concerned with behavior or social problems read the last chapter at the very least. Even a brief exposure to the optimism and crusading integrity of one of the pioneers in this not-too-popular field can be rewarding.

Claire M. Vernier

Benton, Authur L. *Right-Left Discrimination and Finger Localization.* Hoeber-Harper, New York, 1959. xv + 185 pp. $7.00

This book presents a review of the historical, experimental, and ideational concepts of the "body images" of right-left orientation and finger gnosis. The author attempts to assess the present status of our understanding of these problems critically, not only fo their use in the diagnosis and treatment o brain-damaged children and adults, but als in the broader frame of reference of behavior

He points out the diversity and complexit of responses possible when dealing wit these two relatively well-defined deficits which may in reality apply to extremel broad concepts. Available clinical literature, his own studies, and work with mental defectives and known brain-damaged childre and adults are analyzed, using the methods of modern behavior analysis in the light of current assumptions concerning the "body schema."

Of particular value is the detailed presentation of findings at different ages in the development of normal, defective, and known brain-damaged children and adults concerning concepts of body image with reference to right-left discrimination and finger localization. The standardized simple tests which the author has used in his own study and those of other investigators are presented in sufficient detail that they may readily be used by the reader, if he is so inclined. These are set forth in varying degrees of complexity with suggestions for avoidance of such discrepancies from one set of data to another as are already in the literature.

Some of the author's complex theoretical conclusions might be disputed by others with different experience, but he is to be commended for setting forth his thesis in such a way as to incite other investigators to elaborate on his studies and his concepts, and so prove him right or wrong.

Besides its value to other investigators, this book should be useful to pediatricians, neurologists, psychiatrists, psychologists, educators, and workers in the field of child development, particularly including those who work with various types of retardation: language disorders (including reading disabilities) and problems concerning cerebral dominance—in short, all concerned with these facets of human behavior.

A useful bibliography is appended.

Barbara Hulfish

This is a recently published book written by Arthur Benton, Ph.D., psychologist at State University of Iowa. The 185-page volume consists of eight closely interwoven chapters.

The first five chapters present methods of assessing finger localization and right-left discrimination. These chapters, occupying almost half of the book, which treat of the normative aspects and developmental disturbances right-left discrimination and finger localization, the methods of investigation and test batteries used, their detailed description and the reports of the "results secured in their application to normal children and adults and to mental defectives and brain-damaged patients," are praiseworthy and of potential scientific value. The subsequent chapters of the book are organized on a two-fold basis with theoretical and clinical-pathological statements interspersed.

The monograph deals in essence with two topics. While its title is *Right-Left Discrimination and Finger Localization*, it is tacitly assumed that by the term, finger localization, the author means the normal counterpart of finger agnosia. But this term possesses distinct drawbacks, rendering it ambiguous and possibly confusing for the uninitiated reader. In particular, being often preceded by the adjective "tactual" in the text, it could easily be mistaken in the sense of connoting the ability of correct tactile localization and discrimination, a defect of which is usually manifested unilaterally (in a one-sided cerebral lesion) in the distal parts of the upper extremities, especially in the sphere of hands and fingers. Such a defect signifies an atopognostic, not a somatognostic disorder. Apart from this consideration, finger localization actually constitutes only one aspect—among many—of the comprehensive function of bilateral finger recognition, on one's own hands as well as those of others. The healthy counterpart of what has been termed finger agnosia by this reviewer is logically finger gnosis, a term least open to objection; the former commonly presenting itself as a primary conceptual-symbolic disorder of the function of finger gnosis. The title of the book therefore should have rightly been *Right-Left Discrimination and Finger Gnosis*. Tactile, proprioceptive, optic, and other sensory or perceptual functions, as well as verbal signification of individual fingers, are rather building-stones in the development of finger gnosis. A finger agnosia does not represent a dissolution of finger gnosis into its original developmental constituent components, but a regression of the function as a whole to a variable lower level of performance.

The main criticism of Benton's monograph concerns the various chapters and sections dealing with important clinical-phenomenological conditions and complex cerebro-pathological manifestations, as well as their differential- and local-diagnostic evaluation. Here Benton shows himself poorly equipped in terms of basic competence adequately to treat such matters, which are essentially extraneous to his professional training as a psychologist. His discussions in the clinical-pathological and kindred fields are marked by an imprecision in neurological observation and knowledge, as well as formulation and thought, that renders inaccurate or controversial many of his assumptions and theoretical pronouncements. Besides, there are dispersed throughout the volume, from the very first pages to the last, a striking array of misconceptions, misinterpretations, and misquotations as well. Some of the authors so concerned are Badal, Lange, Pick, Gerstmann, Head, Critchley, Schilder and Heimburger. Limitation of space does not permit a detailed discussion here, except perhaps in the case of the French ophthalmologist, Badal.

Inextricably interwoven throughout Benton's whole book, and the basis of many of his assumptions, is a case history reported in 1888 by Badal, in the "Arch. d'opthal.," under the title "Contribution a l'etude des cécités psychiques: Alexie, agraphie, hémianopsie inférieure, trouble du sens de l'espace." This is a 21-page case report, at the present time not easily accessible to many interested readers, and in view of the importance he places on it, Benton might well have reproduced it in its entirety, which could have easily been done in a book of this size. Instead, Benton quotes a fragment out of context, and expounds conclusions of his own. Those readers who do not know the Badal case report are not given the chance to make up their own minds as to the clinical-diagnostic and pathological nature and implications of the voluminous and complex symptomatology of the case. Moreover, after glancing through the various chapters of the monograph one can only express amazement and incredulity at the attempts to derive such a wide range of behavioral phenomena from a report of a single case not personally observed or studied.

The Badal case concerns a young female patient who, following severe eclampsia and after a transitory confusional state, developed—apart from a virtually complete bilateral inferior hemianopsia and a very considerable constriction of both superior visual fields—a complicated and most severe cerebro-pathological symptomatology. Badal described the condition at great length, though often employing qualitatively inadequate techniques of examination and leaving many important questions unanswered.

As can be readily seen from a careful study of the extensive report of Badal, his case constituted, in essence, no more than an interesting condition of a very comprehensive visual disorientation in space; a condition that in later years has become clinico-pathologically established and well-known as a so-called visuo-spatial agnosia. This condition is related to disorientation and loss of recognition in extra-personal space, as contrasted to disorientation and loss of recognition in personal space in cases of finger agnosia.

The clinical picture of the Badal case consisted principally of a profound disorder of visual-spatial functions, associated with some other sensory or perceptual-spatial disturbances; resulting in extremely severe defects of orientation in extra-personal space, and of recognition and appreciation of spatial relationships of objects to each other, their position, location, distance and size, with gross errors in their absolute and relative localization in their environment. The patient also showed impairment of visual attention, inability to fixate, loss of topographic memory, with impairment of spatial-directional orientation, marked visuo-spatial as well as constructional defects concerning the abilities of writing (particularly copying), reading, and (to a lesser degree) calculation, incapability of simple drawing (from memory or model) and disorder of various other spatial manipulations, spatial confusion of right and left sides, disturbances of tactile localization and two-point discrimination, and of ability to localize fingers subjected to tactile or algesic stimuli. This latter indicated that these disturbances were primarily perceptual-spatial (atopognostic) rather than somatognostic in origin. There were also other disturbances, such as various apractic defects, particularly marked dressing apraxia, an auditory-spatial disorientation, and some degree of temporal disorientation. All these diverse and inter-related disorders were regarded by Badal as due to profound defects of what he called "the sense of space."

Badal did not reach a diagnostic conclusion in his case; he merely posed the question whether the condition shown by his patient was "purely functional" (in terms of traumatic hysteria) or "due to organic lesion."

In the introduction to his case report, Badal referred to the conglomeration of all the various manifestations in his patient as "a strange combination of bizarre and incoherent phenomena." This is certainly a nondescript term. Badal also included the following passage on pages 110–111 of his case-report (and on this very short section of the 21-page report Benton seemingly has based much of his deductions and pronouncements). Badal writes, "If there is no allochiria proper, because the sensations are really perceived on the side where the excitation is produced, and not on a symmetric point of the opposite side . . . there are, however, bizarre disturbances of the sense of touch. Thus, frequently the patient is unable to tell which of her fingers one touches or which one pricks, and she refers, for example, to the index finger a prick made on the ring finger." After stating that "the cutaneous sensibility . . . is considerably dulled, and in order that two pricks made simultaneously be perceived distinctly, the distance between the pricks has to be much greater than in a normal condition," Badal also notes that, "Sometimes the same errors occur, although the eyes are left open, so that they could control the tactile impressions; moreover, if one tells Valerie to name the five fingers of the hand, one after the other and in the order in which they are placed, it is seldom that she does not commit some error, either in naming them or classifying them from one to five." Note in this quotation from the original case report Badal's use of the term "tactile," not the term "optic," as Benton quotes it (p. 2). This is an important error.

Badal did not enlarge on this finding, nor did he repeat it or refer to it on any other page of the report, although the case history is full of many other repetitions, even irrelevant ones. Nor is there another related reference indicating a repetition of this test or an execution of any other relevant mode of examination, amplifying the afore-cited one. As stated, Badal called the above-quoted fragmentary features "bizarre phenomena," but found himself incapable of interpreting or categorizing them. He supposed that very probably the "erroneous perceptions are, above all, due to a profound alteration" of the same "sense of space" which he held responsible for all the various manifestations of the patient's severe spatial disorder, briefly listed in the above summary of the symptomatology of the case. There was neither a discussion, nor a differential-diagnostic evaluation, nor a specific analysis of these findings. Its real meaning therefore remains obscure. Badal believed that his patient suffered from a general disorientation in space, which seemed to have been predominant in the optic realm, but affected other sensory and perceptual modalities, including the ability of spatial localization of tactile stimuli and two-point discrimination in the area of hand and fingers.

It should be noted here, in view of the central issue under discussion, that Pick, though citing extensively from the Badal case report regarding the patient's severe visual-spatial disorientation and referring briefly to her right-left confusion, had never made any mention whatever to a "finger agnostic disturbance" or the like in his monographs of 1898 and 1908 (listed in Benton's bibliography). Yet, in a cryptic sentence on page 3 of his book Benton has attempted to create the impression that Pick had done so. It might also be worth noting that Benton's citation of Lange on page 2 of the present volume is not correct: Lange, as far back as in 1933, modified his previous hypothesis in favor of the conception of personal as opposed to extrapersonal space.

Benton's assumption, that Badal "described finger agnosia" is thus contradicted by the latter's case report itself. At no place in the case history (nor in any other of Badal's later writings) is there any reference whatever (nor an intimation or allusion) to that effect. This misinterpretation of Benton is surprising in view of the fact that in the extensive literature on the subject of the Gerstmann Syndrome there had been formulated repeatedly the conceptual aspects and clinical symptomatology as well as the technique of examination for finger agnosia.

It is clear that Badal did not make an examination to test the ability of recognition and orientation (as well as differentiation, selection and the like) with respect to the fingers of both hands. More, the testing for verbal designation was fragmentary, unclear and inconclusive; the real meaning of the patient's verbal designations was certainly not appreciated by him, as can readily be deduced from his own record. Being an ophthalmologist, he also failed to consider the obvious possibility of a primary amnesic-aphasic impairment of finding words (due to the extensive brain damage and general reduction of cerebral activity) as the primary cause for the patient's difficulty in naming the fingers. Moreover, an examination of the power of recognition and orientation of other sections or organs in the realm of the body as a whole was omitted. Nor did Badal realize the necessity for such an examination.

In point of fact Badal has not "described finger agnosia." He never used this or a similar term, nor can it be detected in his extensive article. It might be of historical interest here to point out that the term, agnosia, was not yet born when Badal wrote his case report (1888). The work was first employed in a cerebropathological connection by Sigmund Freud in his classic treatise "On Aphasia," published in 1891.

Badal merely reported a case of a very severe and predominantly visual disorientation in space (or, to use contemporary jargon, a visuo-spatial agnosia.) His scantily and superficially recorded notation in the case history pertaining to the patient's fingers, and quoted above, was called "bizarre phenomena," and this nondescript characterization Badal applied to the entire clinical symptomatology of the case. It was not appreciated as a somatognostic disturbance nor can it now be justifiably regarded in such terms. It does not constitute a clinical condition of the kind resembling the one nominally and descriptively defined by this reviewer, and generally confirmed by others, called finger agnosia.

It would not be surprising that a patien with bilateral general or visual disorientatio in outer space due to *bilateral* parieto-occipital disease primarily affecting extrapersona space, but capable of encroaching upo personal space, should also prove to hav some elements of finger agnosia, though usually concealed behind a more extensive o diffuse clinical picture, or else unrealized a such. The converse does not occur, however. That is, a patient with the Gerstmann Syndrome due to *unilateral* (dominant) parieto-occipital lesion, typical or atypical, is usuall not disoriented in outer space and does not show symptoms of visuo-spatial-agnostic disturbances as to position, distance, directional, dimensional, and topographical relationships of objects outside the body.

In the light of the foregoing evidence, Benton's statement that the above-cited brief quotation from the Badal case report might be explained as a "finger agnosia, unrecognized as such," proves to be wholly unfounded. His persistence in this point of view almost suggests a fixed preconception. Disregarding the real aspects of the case report, he has deduced various unsubstantiated conclusions from it, and made it a starting point of diverse theoretical assumptions. His attempts to equate Badal's "bizarre phenomena" with what this reviewer originally designated and described in its various aspects as finger agnosia, appear similar to the line of reasoning which also attempts, in this volume, to equate finger agnosia with graphaesthesia.

It should be mentioned that Badal was still alive when my first publications on finger agnosia and its associated features appeared (in 1924 and 1927) and these observations were readily confirmed by the work and publications of other authors in various countries, notably by O. Poetzl (successor to A. Pick). Badal died in 1929. If there had been any relationship between his case and the finger agnosia in what "soon came to be known as the Gerstmann Syndrome," it would certainly have been noted by Badal himself, or called to his attention by his co-workers.

I should like, finally, to point out the dangers involved in drawing undue conclusions from a single case, not observed or examined personally, but in this instance known only from the reading of a case history published 72 years ago, by an opthalmologist describing the condition of a severe visual disorientation in space.

Josef Gerstmann

CHESS, STELLA. *An Introduction to Child Psychiatry*. Grune and Stratton, New York, 1959. x + 254 pp. $5.25

In her preface to *An Introduction to Child Psychiatry* Dr. Chess states that, "this book attempts to meet the need of the various groups of newcomers to the field for an introduction to the subject matter and procedures of child psychiatry." Among the newcomers "who are making their first excursions into the realm of childhood" the author includes psychiatrists-to-be, social workers, nurses, psychologists, teachers, general psychiatrists trained to deal with adults, and pediatricians. How well Dr. Chess achieves this goal should be a basic criterion of the worth of her book. It is the reviewer's opinion that she has achieved this goal admirably.

The subject matter gives the reader the feeling of a substantially complete survey of the field of child psychiatry. Classical topics such as the development of the child, the diagnostic process, a fairly detailed diagnostic classification with meaningful descriptions of categories, and a brief history of child psychiatry, lend a necessary solidity. A clinical utilitarianism is supplied, for example, by a discussion of "special stress situations" which the practitioner will meet in his everyday work and which are not included in the usual diagnostic categories. These situations are: acute and chronic physical illness, handicaps, hospitalization, learning difficulties and adoption.

The simple and readable writing style, quite non-technical in nature, is another characteristic which will aid the newcomer in his comprehension of the field of child psychiatry. It is a tribute to the skill and experience of the author that she can express so palatably, in an integrated manner, many helpful clinical suggestions, impressions and hints that must be the distillate of many years of meaningful experience in the field.

The one discussion of an area that to this reviewer might be misleading, is that of Child Analysis. As an example of child analysis, the author describes the treatment of a boy seen weekly for one and a half years "with whom instinctual drives were not scrutinized." Although Dr. Chess does remark that classical Freudian child psychoanalysts tend to feel that three to five sessions a week are indispensable (and does not state that the time involved is usually longer than one and a half years), and although she does discuss modifications of analytic treatment which consider one or two sessions a week feasible for child analytic work, she does not specify what theoretical framework for her modification of classical Freudian analysis is being used. The beginner may be misled into thinking that this case presentation should properly be considered to be that of a child analysis; whereas the classical Freudian child analyst would surely maintain, rather, that it is an example of psychoanalytically-oriented play therapy. As such more correctly it should be considered in the chapter entitled Play Therapy.

This single drawback, however, does not detract from the effectiveness of this book as a most satisfactory introduction to the field of child psychiatry.

Joseph S. Bierman

DE MARTINO, MANFRED F., ED. *Dreams and Personality Dynamics*. Charles C Thomas, Springfield, Ill., 1959. xvii + 377 pp. $10.50

There are several ways of preparing a book for publication. One is to decide that you have something to say that others should be interested in reading, and write it. Another way to proceed is to have an idea which can form the central theme of a book and to get experts on a particular aspect of the topic to write about their area of competence. A third way to get a book ready for the publishers is to choose a topic and then select a number of articles in the journals which are relevant. De Martino has followed this last course; he has selected from the literature on dreams 28 articles which appeared from 1930 to 1958 as journal articles, doctoral dissertations, and chapters in books, and either has reprinted them entirely or abridged them—apparently by simply leaving out parts of the original.

The book is intended as an anthology which "was organized with the aim of making it one which would be of interest and value not only to students, psychological clinicians, and those who practice dream analysis, but also to academic psychologists." The editor hoped that his book would " . . . serve to enhance the understanding of dreams and personality as well as stimulate psychologists and other trained persons to engage in dream research . . ."

In the introductory section the editor gives an enthusiastic overview of what is to come; there follow articles describing dream books throughout the years and a history of dream interpretation as seen in ancient and medieval writings. The second section deals with empirical and statistical studies describing what adults and children dream about, and sex differences in dreams. The following chapter contains articles describing the meaning of certain common dream themes as well as a cognitive theory of dreams by Hall. In the next section, personality correlates of dreams, attempts to relate dreams to authoritarian attitudes, essential hypertension, organic psychoses, and other variables are detailed. Next follow discussions of methods of dream analysis, and reports of experiments relating dreams to responses to projective tests. The book concludes with articles by Kleitman, Dement, and Wolpert on the physiological correlates of dreams.

As one might for any "reader" on dreams, one can object to the selection of some authors and the failure to include others. In the introduction De Martino explains that no article by Freud is included since his works are readily available. This raises the crucial issue as to how to achieve the editor's purpose in preparing the book. If it is intended as a brief survey of landmarks or highlights of what has been written on the general subject of dreams and personality, then there is no explaining away the omission of selections from Freud, Fromm, Poetzl, among others. If it is written as a report of the current status of our knowledge about dreams and personality dynamics, then there should have been some continuity between chapters and a critical evaluation of some of the more controversial points. Thus for example, Klein writes on page 257, "On the basis of the evidence accumulated during our experimental studies of dreaming during hypnosis, the conclusion that such dreaming is the same in kind and mechanism as ordinary night dreaming may be regarded as unequivocally established." On page 270 Brenman writes, "We question the assumption that the hypnotic dream is a psychic production which duplicates either in function or structure, the spontaneous night dream." This reviewer feels that the reader should not be left with the burden of trying to reconcile this kind of difference without some help from the editor. The book would have had a much larger audience appeal with this kind of editorial assistance, and would then have served its stated purpose more successfully.

The book is certainly not intended for popular reading, yet the editor has omitted (with one exception) all bibliographies which must have been included with the original articles. This necessitates referring to the original to be able to follow up any questions one may have about references mentioned. The annoyance of the more obsessive readers would also have been alleviated by more careful editing of the manuscript; there are many misspellings and other editorial lapses.

Despite this reviewer's prejudice about books which are contrived by arranging a series of articles in orderly array, the book does serve to highlight the rather inadequate state of our knowledge in the area of dreams and personality dynamics. Although dreams have been employed in psychotherapy for many years, there is still wide disagreement as to their significance and value in therapy as well as in our understanding their usefulness in describing personality functioning. It might well be as C. S. Hall has stated, "that dreams constitute the best material for studying the conceptual systems of a person and that such knowledge is absolutely essential if we are to understand why people behave as they do." If De Martino's book serves to accelerate interest in resolving some of the questions about dreams, it will have served a useful purpose.

Shabse H. Kurland

Bliss, E. L. and Branch, C. H. Hardin. *Anorexia Nervosa.* (A Psychosomatic Medicine Monograph.) Hoeber, New York, 1960. vii + 210 pp. $5.50

The appearance of *Anorexia Nervosa* fills a long-felt need for a comprehensive study of this curious and often intractable condition. The high quality of the work, the good judgment of its authors and their judicious conclusions from clearly stated evidence assure it a place among standard medical reference works.

Following a scholarly chapter which places anorexia nervosa in historical perspective the authors devote nearly two hundred pages to a careful psychological and physiological study of 22 cases. This level of investigation—in terms of population size and intensity of study—is one which has found increasing favor among clinical investigators, and is one well suited to anorexia nervosa. For it permits a far more penetrating inquiry than do more extensive surveys, while avoiding the all-too-frequent loss of perspective engendered by the intensive study of one or two cases. The authors make good use of the opportunities afforded by their level of investigation. They present careful descriptions of the behavior they have observed, consider relevant current theories in the light of this evidence and scrupulously distinguish between observation and inference.

The authors' investigation of the role of pregnancy fantasies in the pathogenesis of anorexia nervosa affords an example of their approach. They begin by saying that "when this study was initiated we were aware that several authors had attributed great significance to (pregnancy) fantasies as prime movers in the genesis of anorexia nervosa. Consequently we were particularly alert to their presence in our cases and made every effort to determine their existence." They did, indeed, find pregnancy fantasies in some of their patients. However, they also found that: 1) such fantasies were not common, 2) they occurred also in patients with no nutritional problems, 3) they were as frequently non-oral as oral (the purportedly pathogenic variety) and 4) even in those patients with pregnancy fantasies, the relevance of the fantasy to the anorexia was often problematical.

Bliss and Branch report no startling discoveries nor any tidy theoretical formulations. Instead, the outstanding impression conveyed by this study is of the remarkable differences between persons suffering from anorexia nervosa. Even in their small sample the authors find patients who are severely disturbed and others with transient maladjustments, young and old, and, indeed, the whole spectrum of human infirmities. Such findings, so similar to those being reported in other psychosomatic conditions, should disabuse us of the facile notions and high-level generalizations which have so often passed for evidence in this field.